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PERFORMANCE SPECIFICATION

COATING SYSTEM, NONSKID, FOR ROLL OR SPRAY APPLICATION

This specification is approved for use by the Naval Sea Systems Command and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers nonskid systems, coatings, and coverings for application to weather decks, flight decks, and hangar decks of aircraft carriers, surface combatants, and amphibious, auxiliary, and sealift ships, and submarines. Coatings are applied to steel, aluminum, and special hull treatment surfaces by spraying, rolling, or other application method as designated by the manufacturer of the nonskid system.

1.2 Classification. The nonskid systems covered by this specification are of the following types, compositions, classes, grades, and applications, as specified (see 6.2).

1.2.1 Types. The types of nonskid systems are as follows:

a. Type I - Standard durability, rollable
b. Type II - Standard durability, sprayable
c. Type III - Submerged applications, rollable
d. Type IV - Submerged applications, sprayable
e. Type V - Extended durability, rollable
f. Type VI - Extended durability, sprayable

1.2.2 Compositions. The compositions of nonskid systems are dependent on aggregate use and are categorized as follows:

a. Composition D - Density-controlled abrasive deck system
b. Composition G - General use abrasive deck system
c. Composition L - Limited use aircraft carrier landing and run-out area deck system that is less abrasive to the steel arresting cable

1.2.3 Classes. The classes of nonskid systems are segregated by functionality as follows:

a. Class 1 - Standard

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AMSC N/A FSC 8010

b. Class 2 - Color stable

c. Class 3 - Low solar absorbent (LSA)

d. Class 4 - Resilient (for use where flexibility is required)

e. Class 5 - Submerged elastomeric applications

f. Class 6 - Low profile

g. Class 7 - High temperature

1.2.4 Grades. The grades of the nonskid system are based on the number of components in the coating:

a. Grade A - One component coating

b. Grade B - Two component coating

1.2.5 Application. The applications for nonskid systems are organized by cure characteristics as follows:

a. Application 1 - Standard cure

b. Application 2 - Fast cure

c. Application 3 - Low temperature cure

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

COMMERCIAL ITEM DESCRIPTIONS

A-A-59982 - Application Spray Equipment for Nonskid Coatings

A-A-59984 - Mixer, Automated, Transportable, Nonskid Coating

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-5624 - Turbine Fuel, Aviation, Grades JP-4 and JP-5

MIL-D-16791 - Detergents, General Purpose (Liquid, Nonionic)

MIL-S-22698 - Steel Plate, Shapes and Bars, Weldable Ordinary Strength and Higher Strength: Structural

MIL-PRF-23699 - Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Numbers: O-152, O-154, O-156, and O-167

MIL-PRF-24385 - Fire Extinguishing Agent, Aqueous Film-Forming Foam (AFFF) Liquid Concentrate, for Fresh and Sea Water

MIL-PRF-32177 - Cleaning Compound, Nonskid

MIL-PRF-83282 - Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-1623 - Fire Performance Requirements and Approved Specifications for Interior Finish Materials and Furnishings (Naval Shipboard Use)

(Copies of these documents are available online at https://quicksearch.dla.mil.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910	-	Occupational Safety and Health Standards
40 CFR 60, Appendix A-7, Method 24	-	Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings
40 CFR 63	-	National Emission Standards for Hazardous Air Pollutants for Source Categories
40 CFR 63, Subpart II	-	National Emission Standards for Shipbuilding and Ship Repair (Surface Coating)
40 CFR 261.24	-	Toxicity Characteristic

(Copies of these documents are available online at www.ecfr.gov.)

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846 - Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

(Copies of this document are available online at www.epa.gov.)

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH Manual of Analytical Methods (NMAM), Method 7500 - Silica, Crystalline, by XRD (Filter Redeposition)

(Copies of this document are available online at www.cdc.gov.)

NAVAL SEA SYSTEMS COMMAND (NAVSEA) PUBLICATIONS

T9070-AL-DPC-020/077-2 - NAVSEA Hazardous Material Avoidance Process

(Copies of this document are available online via Technical Data Management Information System (TDMIS) at https://mercury.tdmis.navy.mil/ by searching for the document number without the suffix. Refer questions, inquiries, or problems to: DSN 296-0669, Commercial (805) 228-0669. This document is available for ordering (hard copy) via the Naval Logistics Library (NLL) https://nll.navsup.navy.mil. For questions regarding the NLL, contact the NLL customer service at nllhelpdesk@navy.mil, (866) 817-3130 or (215) 697-2626/DSN 442-2626.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

ASTM A229/A229M	-	Standard Specification for Steel Wire, Quenched and Tempered for Mechanical Springs
ASTM A514/A514M	-	Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding

ASTM B117	-	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B928/B928M	-	Standard Specification for High Magnesium Aluminum-Alloy Products for Marine Service and Similar Environments
ASTM C136/C136M	-	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D523	-	Standard Test Method for Specular Gloss
ASTM D660	-	Standard Test Method for Evaluating Degree of Checking of Exterior Paints
ASTM D661	-	Standard Test Method for Evaluating Degree of Cracking of Exterior Paints
ASTM D714	-	Standard Test Method for Evaluating Degree of Blistering of Paints
ASTM D823	-	Standard Practices for Producing Films of Uniform Thickness of Paint, Coatings, and Related Products on Test Panels
ASTM D1141	-	Standard Practice for the Preparation of Substitute Ocean Water
ASTM D1640/D1640M	-	Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings
ASTM D1652	-	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D1654	-	Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D1895	-	Standard Test Methods for Apparent Density, Bulk Factor, and Pourability of Plastic Materials
ASTM D2000	-	Standard Classification System for Rubber Products in Automotive Applications
ASTM D2572	-	Standard Test Method for Isocyanate Groups in Urethane Materials or Prepolymers
ASTM D3278	-	Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D3924	-	Standard Specification for Standard Environment for Conditioning and Testing Paint, Varnish, Lacquer, and Related Materials
ASTM D4214	-	Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4417	-	Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D4541	-	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM E903	-	Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
ASTM E1252	-	Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis
ASTM E1347	-	Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry

ASTM F137	-	Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus
ASTM F718	-	Standard Specification for Shipbuilders and Marine Paints and Coatings Product/Procedure Data Sheet
ASTM G8	-	Standard Test Methods for Cathodic Disbonding of Pipeline Coatings
ASTM G14	-	Standard Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test)
ASTM G154	-	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
ASTM G173	-	Standard Tables for Reference Solar Spectral Irradiances: Direct Normal and Hemispherical on 37° Tilted Surface

(Copies of these documents are available online at www.astm.org.)

SAE INTERNATIONAL

SAE-AMS1424	-	Deicing/Anti-Icing Fluid, Aircraft, SAE Type 1
SAE-AMS-STD-595	-	Colors Used in Government Procurement
SAE-AMS-STD-595/11105	-	Red, Gloss, OSHA Safety Red/Department of Transportation Highway Red
SAE-AMS-STD-595/11136	-	Insignia Red, Gloss
SAE-AMS-STD-595/13538	-	Yellow, Gloss
SAE-AMS-STD-595/14062	-	Deep Green, Gloss
SAE-AMS-STD-595/14088	-	Olive Drab Green, Gloss
SAE-AMS-STD-595/15177	-	Blue, Gloss
SAE-AMS-STD-595/15182	-	Blue, Gloss, Coast Guard Blue
SAE-AMS-STD-595/16076	-	Dark Gray, Gloss
SAE-AMS-STD-595/17038	-	Black, Gloss
SAE-AMS-STD-595/17875	-	Insignia White, Gloss
SAE-AMS-STD-595/17925	-	Miscellaneous, Gloss, Bright White
SAE-AMS-STD-595/26008	-	Deck Gray, Semi-Gloss
SAE-AMS-STD-595/26270	-	Haze Gray, Semi-Gloss
SAE-AMS-STD-595/31136	-	International Red, Flat
SAE-AMS-STD-595/33538	-	Yellow, Flat
SAE-AMS-STD-595/34088	-	Olive Drab Green, Flat
SAE-AMS-STD-595/36076	-	Dark Gray, Flat
SAE-AMS-STD-595/36173	-	Ocean Gray, Flat
SAE-AMS-STD-595/36231	-	International Gray, Flat

SAE-AMS-STD-595/36270 - Haze Gray, Flat

SAE-AMS-STD-595/37038 - Black, Flat

SAE-AMS-STD-595/37875 - White, Flat

(Copies of these documents are available online at www.sae.org.)

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC-PA 2 - Paint Application Specification No. 2, Measurement of Dry Paint Thickness with Magnetic Gages

SSPC-SP 1 - Solvent Cleaning

SSPC-SP 10 - Near-White Blast Cleaning

SSPC-SP 17 - Thorough Abrasive Blast Cleaning of Non-Ferrous Metals

(Copies of these documents are available online at www.sspc.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. Nonskid systems furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

3.2 Materials. Each individual coating and final combined product of the total nonskid system qualified to this specification shall, when mixed and applied in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2), conform with the appropriate requirements. The composition of the nonskid system furnished to this specification shall be the responsibility of the manufacturer, except as limited by this specification.

3.2.1 Description.

3.2.1.1 Types I through VI. The total nonskid system shall consist of a primer, optional underlayment (for class 4), nonskid, and color topping.

3.2.2 Volatile organic compounds (VOC) limits. When tested in accordance with 4.7, the VOC content of all individual coatings of the nonskid system shall be not greater than 2.08 pounds per gallon (250 grams per liter), except for the primer and color topping, which shall be not greater than 2.8 pounds per gallon (340 grams per liter).

3.2.3 Hazardous air pollutant (HAP) content. When evaluated in accordance with 4.8, the total HAP content of each individual coating of the nonskid system, as defined by the 40 CFR 63, subpart II requirements, shall not exceed the VOC limit prescribed for the specific coatings in accordance with 3.2.2.

3.2.4 Hazardous pigments and additives.

3.2.4.1 Metals content. When tested in accordance with 4.9.1, the content of each soluble metal and the total content of each metal in each individual cured coating of the nonskid system shall not exceed the values listed in table I. Total metal content values may also be submitted to satisfy soluble metal content requirements when the total metals value is converted to milligrams per liter and determined to be lower than the maximum soluble metal content limits appearing in table I.

TABLE I. Metals content.

Metal or its compound in each individual cured coating	Soluble metal, maximum (mg/L)	Total metal content, maximum (wt%)
Antimony	15	0.015
Arsenic	5	0.005
Barium (excluding barite)	100	0.10
Beryllium	0.75	0.0002
Cadmium	1	0.0005
Chromium (VI) compounds	1	0.001
Chromium	560	0.56
Chromium (III) compounds	560	0.56
Cobalt	50	0.005
Copper	25	0.01
Fluoride salts	180	0.18
Lead	5	0.005
Mercury	0.2	0.0002
Molybdenum	350	0.35
Nickel	20	0.02
Selenium	1	0.002
Silver	5	0.001
Tantalum	100	0.100
Thallium	7	0.007
Tungsten	100	0.100
Vanadium	24	0.01
Zinc	250	0.25

3.2.4.2 Crystalline silica content. When evaluated in accordance with 4.9.2, each individual coating of the nonskid system shall not contain crystalline silica in excess of 0.1 percent by weight of the dry paint or coating.

3.2.5 Prohibited materials. The nonskid system shall not contain any chemicals categorized as “prohibited” in accordance with T9070-AL-DPC-020/077-2.

3.2.6 Toxicity. When evaluated in accordance with 4.6, the nonskid system shall pose no serious or high risk to the health of personnel or the environment when used for its intended purpose (see 4.6 and 6.10).

3.2.7 Aggregate density (composition D). When evaluated in accordance with 4.5.23, the aggregate blend density value shall be between 0.35 and 0.52 ounce per cubic inch (0.6 and 0.9 gram per cubic centimeter).

3.2.8 Aggregate hardness (composition D). When evaluated in accordance with 4.5.24, the maximum hardness value of any aggregate type tested shall not exceed a rating of 6 on the Mohs scale.

3.2.9 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3 Identification characteristics. Identification characteristics listed in table II shall conform to the values established by the manufacturer during qualification testing and shall meet the requirements in table II. The values shall be established for each individual coating that comprises the nonskid system prior to qualification testing. The purpose of these values is to serve as a basis for determining that the material being offered is of the same formulation as that which was approved under qualification testing. Conformance inspections shall be as specified (see 4.3).

TABLE II. Identification characteristics.

Characteristic	Two-part coating		Aggregate	One-part coating or combined mixture
	Base material, component A	Curing agent, component B		
Chemical nature (percent [%] of each material which comprises 2% or more of the coating)	X	X		X [1/]
Resin solids by mass (%)	X	X		X
Pigment by mass (%)	X	X		X
Volatile matter by mass (%)				X
Aggregate by mass (%)	X	X		X
Aggregate size distribution (ASTM C136/C136M)			X	
Aggregate composition (% of each material which comprises 10% or more of the aggregate)			X	
Aggregate density (ASTM D1895) [3/]			X	
Aggregate hardness (Mohs scale rating) [3/]			X	
Mass (kilograms per liter [pounds per gallon])	X	X		X
Epoxy content [1/] (ASTM D1652)	X			
Active amine hydrogen content		X		
Pigment analysis	X	X		[2/]
Infrared spectrum of resin	X	X		[2/]
Flash point	X	X		X
VOC (g/L coating less water)				X
Coverage (square feet per gallon [square meters per liter])				X

NOTES:

[1/] Isocyanate content, ASTM D2572, if applicable.

[2/] One-part coating only; these analyses are performed on the individual components of two-part coatings.

[3/] For composition D only.

3.4 Coefficient of friction (COF). COF shall be determined in accordance with the sliding block (static COF) (see 4.5.1.1) and the rotating arm (dynamic COF) (see 4.5.1.2) tests.

3.4.1 Static COF. The minimum static COF of the coating system, when tested in accordance with 4.5.1.1 using the sliding block test, shall conform to the values listed in table III.

TABLE III. Static COF.

	Minimum value	
	Dry	**Wet**
Conditioned		
Types I through VI	0.95	0.90
Worn		
Types I through VI	0.90	0.85

3.4.2 Dynamic COF. The dynamic COF of the coating system, when tested in accordance with 4.5.1.2 using the rotating arm test, shall be a minimum of 1.4 on dry test substrates and a minimum of 1.1 on wet substrates.

3.5 Wear of arresting cable (composition L). When tested in accordance with 4.5.2, the nonskid system shall cause less than a 0.001-inch (0.025-millimeter) change in average diameter of the three ⅛-inch (3-millimeter) diameter test rods.

3.6 Impact resistance. When tested in accordance with 4.5.3, all nonskid systems shall have a minimum of 95 percent of the test nonskid system remaining intact and tightly adhering to the panels for both the two panels with no treatment and the two panels subject to the 15-day immersion condition.

3.7 Resistance to wear. When tested in accordance with 4.5.4, the average percent mass loss of the nonskid system shall not exceed 10 percent for types I through IV and shall not exceed 2 percent for types V and VI.

3.8 Flash point. When tested in accordance with 4.5.5, the primer, optional underlayment (class 4), nonskid, and color topping shall not flash at temperatures lower than 100 °F (38 °C).

3.9 Resistance to chemical solutions. When tested in accordance with 4.5.6, the nonskid system shall show none of the following: softening; discoloration; separation between layers of the nonskid system; other signs of deterioration; or corrosion, undercutting, or loss of adhesion beyond ⅜ inch (9 millimeters) from the scribe edge. Failure within ¼ inch (6 millimeters) of the edge of the panel shall be ignored.

3.10 Resistance to accelerated aging by light and water. When tested in accordance with 4.5.7, the test panels shall conform to the following:

a. Adhesion: After exposure to ultraviolet light and condensation of water, the test panels shall show no loss of adhesion or separation between layers of the system.

b. Cracking: When evaluated in accordance with ASTM D661, the nonskid shall show no cracking more than is indicated by a rating of 6.

c. Checking: When evaluated in accordance with ASTM D660, the nonskid shall show no checking more than is indicated by a rating of 6.

d. Chalking (class 2): When evaluated using the wet finger method of ASTM D4214, the nonskid shall have a rating not less than 8.

e. Color stability (class 2): When comparing the original unexposed test panel to the test panel after exposure, the color difference (ΔE) shall be no greater than 1.0 International Commission on Illumination L*, a*, and b* (CIELAB) units.

3.11 Resistance to accelerated corrosion and sequential accelerated corrosion.

3.11.1 Resistance to accelerated corrosion (types I through IV). When tested in accordance with 4.5.8.1, the types I through IV nonskid system on steel and aluminum substrates shall show no separation between layers of the nonskid system and shall show no corrosion, undercutting, nor loss of adhesion beyond ⅜ inch (9 millimeters) from the scribe edge.

3.11.2 Resistance to sequential accelerated corrosion (types V and VI). When tested in accordance with 4.5.8.2, the nonskid system shall exhibit:

a. no loss of adhesion beyond ⅜ inch (9 millimeters) from the scribe edge,

b. no separation between layers of the system,

c. no cracking more than is indicated by a rating of 6 in accordance with ASTM D661,

d. no checking more than is indicated by a rating of 6 in accordance with ASTM D660,

e. no corrosion of the metal substrate beyond ⅜ inch (9 millimeters) from the scribe edge,

f. no undercutting beyond ⅜ inch (9 millimeters) from the scribe edge, and

g. minimum impact resistance of 95 percent.

3.12 Mixing, application, coverage, and drying.

3.12.1 Mixing and application properties. When tested in accordance with 4.5.9, separate samples of each individual coating of the nonskid system shall meet the following requirements:

a. Mixing: Separate samples of each individual coating of the nonskid system shall mix easily with no curdling or separation of ingredients, and shall display no skinning, livering, or curdling, nor hard settling which cannot be dispersed to a uniform consistency when mixed in accordance with the manufacturer's NAVSEA-reviewed ASTM F718 data sheet (see 3.12.4 and 6.2). The nonskid shall be compatible with mixing equipment in accordance with A-A-59984.

b. Primer or color topping application: The coating shall provide uniform coverage of the substrate when applied by roll or spray application at the specified wet film thickness (WFT) in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). Coatings shall exhibit no fingering or indications of air entrainment (crackling or popping sounds) in the mixed coating during spray application. Coatings shall not form craters, blow holes, holidays, or other defects when rolled or sprayed at the specified WFT.

c. Underlayment application: Underlayment shall trowel or roll smoothly during application.

d. Nonskid application by napless roller: The nonskid shall not pull up clumps of already applied nonskid or otherwise accumulate excess nonskid on the napless roller during application. When applied at the specified coverage in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2), the nonskid shall maintain a textured appearance of parallel rows of raised coating, forming peaks and ridges through curing without sagging or slumping.

e. Nonskid application by spray: Spray application shall produce a uniform, rough textured layer of nonskid at the coverage rates specified in the NAVSEA-reviewed ASTM F718 data sheet (see 6.2) with no dripping, spattering, or cobwebbing. The sprayed nonskid shall not puddle or flow to form areas that appear smooth or glossy. The nonskid shall be compatible with spray equipment in accordance with A-A-59982.

f. Drying primer, underlayment, and color topping: The coatings shall dry to a smooth, uniform film, free of spotting, streaking, mud cracking, wrinkling, cratering, orange peel, fisheyes, holidays, or other defects.

g. Dried nonskid: Nonskid shall exhibit a rough surface texture without visible holidays and display consistent surface color and gloss. Rolled nonskid shall retain the raised, textured appearance developed during application. For sprayed nonskid, the aggregate shall be distributed uniformly over the surface, and shall protrude above the resin matrix.

3.12.2 Coverage properties. The individual coatings of the nonskid system shall satisfy performance requirements at the specified square feet per gallon (square meter per liter) of coverage shown in table IV when tested in accordance with 4.5.9.3.

TABLE IV. Coverage.

Component of the nonskid system	Coverage, square feet per gallon (square meters per liter)
Primer	150 – 500 (3.68 – 12.27)
Underlayment (class 4)	22 (0.54) (maximum)
Nonskid (types I, III, and V)	20 – 30 (0.49 – 0.74)
Nonskid (types II, IV, and VI)	40 – 60 (0.98 – 1.5)

3.12.3 Drying time. When tested in accordance with 4.5.9, the maximum drying times shall be as indicated in table V:

TABLE V. Maximum drying time.

Component of the nonskid system	Low temperature 1/	High temperature 2/
Primer or underlayment (application 1, 2)	24 hours at 50 °F (10 °C)	16 hours at 120±5 °F (49±2 °C)
Primer or underlayment (application 3)	48 hours at 35 °F (2 °C)	24 hours at the highest temperature allowed by ASTM F718 3/
Nonskid (application 1, 2)	48 hours at 50 °F (10 °C)	16 hours at 110±5 °F (43±2 °C)
Nonskid (application 3)	48 hours at 35 °F (2 °C)	24 hours at the highest temperature allowed by ASTM F718 3/
Color topping	In accordance with ASTM F718 3/	In accordance with ASTM F718 3/

NOTES:

1/ Requirement refers to both maximum air temperature and maximum substrate temperature.

2/ Requirement refers to both air and substrate temperature.

3/ The manufacturer's NAVSEA-reviewed ASTM F718 data sheet (see 6.2).

3.12.4 Directions for mixing and applying. As part of the manufacturer's NAVSEA-reviewed ASTM F718 data sheet (see 6.2 and 6.6), written directions shall be included on each container, for each individual coating of the nonskid system, for mixing and applying each individual layer of the nonskid system.

3.13 Color and gloss. As specified (see 6.2), the color and gloss of the nonskid shall conform to the requirements of 3.13.1 through 3.13.3 and table VI.

3.13.1 Color and gloss (class 1 and classes 3 through 7). The nonskids and color toppings shall be supplied in one or more of the SAE-AMS-STD-595 colors specified in table VI. When tested in accordance with 4.5.10.1, there shall be no discernable color difference and no discernable gloss difference between the nonskid or color topping and the color chip.

3.13.2 Color (class 2). When tested in accordance with 4.5.10.2, the color difference (ΔE) for the class 2 version of the nonskid and color topping colors specified in table VI shall be no greater than 1.0 CIELAB units compared to the corresponding SAE-AMS-STD-595 color chip.

3.13.3 Gloss (class 2). When tested in accordance with 4.5.10.3, the gloss for the flat nonskid and color topping shall be less than 13 gloss units; the gloss for the semi-gloss nonskid and color topping shall be no less than 13 and no greater than 84 gloss units; and the gloss for the high gloss nonskid and color topping shall be greater than 84 gloss units.

TABLE VI. Color of nonskid and color topping.

Coating	Type	Color description	SAE-AMS-STD-595 reference
Nonskid	I, II, V, and VI	Dark gray, flat	36076
Submerged nonskid	III and IV	Black, flat	37038
Vertical Launch System (VLS) nonskid	I, II, V, and VI	Haze gray, semi-gloss	26270
Color topping	I through VI	Insignia red, gloss	11136
	I through VI	Red, gloss, OSHA safety red/Department of Transportation highway red	11105
	I through VI	Yellow, gloss	13538
	I through VI	Deep green, gloss	14062
	I through VI	Olive drab green, gloss	14088
	I through VI	Blue, gloss	15177
	I through VI	Blue, gloss, Coast Guard blue	15182
	I through VI	Dark gray, gloss	16076
	I through VI	Black, gloss	17038
	I through VI	Insignia white, gloss	17875
	I through VI	Miscellaneous, gloss, bright white	17925
	I through VI	Deck gray, semi-gloss	26008
	I through VI	Haze gray, semi-gloss	26270
	I through VI	International red, flat	31136
	I through VI	Yellow, flat	33538
	I through VI	Olive drab green, flat	34088
	I through VI	Dark gray, flat	36076
	I through VI	Ocean gray, flat	36173
	I through VI	International gray, flat	36231
	I through VI	Haze gray, flat	36270
	I through VI	Black, flat	37038
	I through VI	White, flat	37875

3.14 Total solar reflectance (TSR) (class 3). When tested in accordance with 4.5.11, LSA nonskids shall meet the TSR requirements for the colors specified in table VII.

TABLE VII. TSR requirements.

Color groups	Coating	CIELAB L* range	CIELAB a* range	CIELAB b* range	Minimum TSR
Dark gray	Nonskid	24 to 42	-4.0 to +2.0	-8.0 to +4.0	0.25
Haze gray	VLS nonskid	40 to 77	-4.0 to +3.0	-3.0 to +8.0	0.35

3.15 Working life (grade B). When tested in accordance with 4.5.12, each individual coating of the nonskid system shall meet the application requirements of 3.12.1. Coatings required by the manufacturer's NAVSEA-reviewed ASTM F718 data sheet (see 6.2) to be applied via plural component spray equipment do not require working life testing. After cure-to-full-service of the nonskid in accordance with the manufacturer's NAVSEA-reviewed ASTM F718 data sheet (see 3.12.4), the panels shall meet the COF requirements of 3.4.

3.16 Fire resistance. When tested in accordance with 4.5.13, the nonskid system shall conform to the requirements in MIL-STD-1623.

3.17 Flexibility (types III and IV, or class 4). When tested in accordance with 4.5.14, the type III, type IV, or class 4 coating system shall show no breaking, cracking, or loss of adhesion at the bend. Failure within 0.5 inch (12 millimeters) of the edge of the panel shall be ignored.

3.18 Adhesion of the underlayment (class 4). When tested in accordance with 4.5.15, the minimum adhesion strength of the underlayment shall be 400 psi.

3.19 Immersion resistance (type III/class 1 and type IV/class 1). When tested in accordance with 4.5.16, the nonskid system shall show no pinhole rusting, cracking, or loss of adhesion either between layers or to the substrate. The ASTM D714 blister frequency rating shall be 10 (None), 9 (Very Few), or 8 (Few) and the blister size shall be between a size rating of 10 (for no visible blisters) and 8. Undercutting at the scribe shall not exceed ⅛ inch (3 millimeters). Physical damage caused by handling shall not be considered in the evaluation.

3.20 Cathodic protection (CP) compatibility (type III/class 1 and type IV/class 1). When tested in accordance with 4.5.17, the coating system shall not peel, flake, blister, dissolve, or otherwise fail. Undercutting or peeling shall not exceed 4 percent of the area of the test panel and all undercutting and peeling shall be located adjacent to the holiday.

3.21 Pressure cycling (type III/class 5 and type IV/class 5). When evaluated in accordance with 4.5.18, the nonskid shall be visually inspected by NAVSEA to validate that the nonskid is free of any delamination of nonskid from the substrate, cracks in excess of 1/16 inch in depth, or revealing substrate. Cracks greater in length than 3 inches shall result in failure of the nonskid.

3.22 Strippability (type III/class 5 and type IV/class 5). When tested in accordance with 4.5.19, the nonskid shall be removable from the elastomeric substrate without significant damage to the substrate or seam filler. The removal rate of the nonskid shall be less than 10 minutes per square foot.

3.23 Storage stability.

3.23.1 Long-term storage stability. When tested in accordance with 4.5.20.1, each individual coating of the nonskid system shall meet the requirements of the conformance inspection tests (see 4.3), except the requirements for aggregate density.

3.23.2 Accelerated storage stability. When tested in accordance with 4.5.20.2, each individual coating of the nonskid system shall meet the requirements of the conformance inspection tests (see 4.3), except the requirements for aggregate density.

3.24 Weight. When tested in accordance with 4.5.21, the mass/unit area of the cured nonskid system, including aggregate, shall not exceed the values in table VIII.

TABLE VIII. Weight.

	Gram per square centimeter, maximum	Pounds per square foot, maximum
Types I, III, and V, compositions G and L	0.484	0.99
Types I, III, and V, composition D	0.322	0.66
Types II, IV, and VI	0.215	0.44
Class 4 (with underlayment only)	0.807	1.66

3.25 Resistance to atmospheric and high temperature exposure (composition D/class 7). When tested in accordance with 4.5.22, the nonskid system shall show no signs of peeling, blistering, loss of adhesion, and rusting, and shall comply with the checking and cracking criteria in accordance with 3.10.

3.26 Low profile (class 6). When evaluated in accordance with 4.5.25, the nonskid shall be visually inspected and the condition recorded for information only.

3.27 Performance in-service. When tested in accordance with 4.10, the nonskid system shall show none of the following:

a. Wear-through of the nonskid layer to expose the primer or steel deck (exclude wear-through of composition L nonskid in any area subject to direct wear by arresting wires);

b. ASTM D660 checking (slight breaks in the film not penetrating to the underlying surface) rated less than 8;

c. ASTM D661 cracking (breaks that extend through the coating film to the substrate surface) rated less than 8;

d. Breaking (flaking);

e. Loss of adhesion (peeling);

f. Dynamic COF values less than 80 percent of the initial value specified in 3.4.2; or

g. Other deficiency that would adversely affect ability of applied nonskid system to perform effectively on an in-service flight deck for an 18-month test interval as defined in 4.10.

3.28 Label.

3.28.1 Types I through VI. Label instructions shall be in accordance with 29 CFR 1910. Each container shall be affixed with a hazardous chemical warning label in accordance with 29 CFR 1910.1200. To comply with 40 CFR 63, subpart II, the following two statements shall appear on each coating-can label:

a. Certification that the coating in the container is in accordance with 40 CFR 63.

b. Statement of the ratio of volatile content to solids expressed as grams of volatile organic hazardous air pollutants per liter of solids.

3.28.2 Composition label. Each container with composition “G” material, general use nonskid, shall be conspicuously labeled with an uppercase “G”, blue in color. Each container with composition “L” materials, limited use in aircraft landing and run-out areas, shall be conspicuously labeled with an uppercase “L”, green in color. Each container with composition “D” material, density-controlled nonskid, shall be conspicuously labeled with an uppercase “D”, red in color. If a nonskid system is qualified to multiple compositions, each container of the nonskid system shall include the multiple color letters as described above.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 Qualification inspection. Qualification inspection shall consist of the qualification tests specified in table IX. Tests specified in 4.5.18 (pressure cycling), 4.5.19 (strippability), 4.5.25 (low profile), and 4.10 (performance in-service) shall be performed by only Government activities as specified by the qualifying activity. The performance in-service test shall be conducted on an in-service naval vessel as specified in 4.10 after successful completion of all laboratory tests, with the exception of 4.5.20.1 which shall be performed concurrently. Testing of products on Government ships shall be conducted at the convenience of the Government.

TABLE IX. Qualification and conformance tests.

Characteristic	Classification	Qualification	Conformance	Requirement	Test method
VOC limits	Types I through VI	X	--	3.2.2	4.7
HAP content	Types I through VI	X	--	3.2.3	4.8
Metals content	Types I through VI	X	--	3.2.4.1	4.9.1
Crystalline silica content	Types I through VI	X	--	3.2.4.2	4.9.2
Prohibited materials	Types I through VI	X	--	3.2.5	4.12
Toxicity	Types I through VI	X	--	3.2.6	4.6
Aggregate density 1/	Composition D	X	X	3.2.7	4.5.23
Aggregate hardness	Composition D	X	--	3.2.8	4.5.24
Identification characteristics	Types I through VI	X	--	3.3	4.2.3
Coefficient of friction	Types I through VI	X	--	3.4	4.5.1
Wear of arresting cable	Composition L	X	--	3.5	4.5.2
Impact resistance 1/	Types I through VI	X	X	3.6	4.5.3
Resistance to wear 1/	Types I through VI	X	X	3.7	4.5.4
Flash point 2/	Types I through VI	X	X	3.8	4.5.5
Resistance to chemical solutions	Types I through VI	X	--	3.9	4.5.6
Resistance to accelerated aging by light and water	Types I through VI	X	--	3.10	4.5.7
Resistance to accelerated corrosion	Types I through IV	X	--	3.11.1	4.5.8.1
Resistance to sequential accelerated corrosion	Types V and VI	X	--	3.11.2	4.5.8.2
Mixing, application, coverage, and drying	Types I through VI	X	X	3.12	4.5.9
Color and gloss	Class 1 and classes 3 through 7	X	X	3.13.1	4.5.10.1
Color	Class 2	X	X	3.13.2	4.5.10.2
Gloss	Class 2	X	X	3.13.3	4.5.10.3
TSR	Class 3	X	--	3.14	4.5.11
Working life	Grade B	X	--	3.15	4.5.12
Fire resistance	Types I through VI	X	--	3.16	4.5.13
Flexibility	Types III and IV, or class 4	X	--	3.17	4.5.14

TABLE IX. Qualification and conformance tests – Continued.

Characteristic	Classification	Qualification	Conformance	Requirement	Test method
Adhesion of the underlayment	Class 4	X	--	3.18	4.5.15
Immersion resistance	Type III/class 1 and type IV/class 1	X	--	3.19	4.5.16
Cathodic protection compatibility	Type III/class 1 and type IV/class 1	X	--	3.20	4.5.17
Pressure cycling	Type III/class 5 and type IV/class 5	X	--	3.21	4.5.18
Strippability	Type III/class 5 and type IV/class 5	X	--	3.22	4.5.19
Storage stability	Types I through VI	X		3.23	4.5.20
Weight [2/]	Types I through VI	X	X	3.24	4.5.21
Resistance to atmospheric and high temperature exposure	Composition D/class 7	X	--	3.25	4.5.22
Low profile	Class 6	X	--	3.26	4.5.25
Performance in-service	Types I through VI	X	--	3.27	4.10
Label	Types I through VI	--	X	3.28	4.11

NOTES:

[1/] Needs only to be performed on the nonskid layer.

[2/] Needs to be performed on each layer of the nonskid system.

4.2.1 Systems qualification. Manufacturers shall qualify total nonskid systems consisting of a primer, optional underlayment (class 4), nonskid, and color topping.

4.2.2 Extension of qualification. Approval of qualification for a color for all individual coatings of the nonskid system, excluding the color topping, shall constitute approval for other colors of the same type, composition, class, grade, and application. The manufacturers shall validate that all colors shall satisfy the requirements of 3.2.2, 3.2.3, 3.2.4, 3.2.5, and 3.13 by either analytical testing or documentation. Testing and qualification of one color variant of a color topping shall be automatically extended to all other colors for the same product within a particular gloss category, provided that the only difference in the product formulations is in the color pigment concentrations. Nonskid systems submitted for type V or VI qualification testing that do not pass the durability requirements for type V or VI, but do pass the durability requirements for type I or II, may be qualified as type I or II nonskid systems respectively, of the same composition, class, grade, and application provided that the system passes all other requirements for that type, composition, class, grade, and application. Products qualified to type V or VI are inherently qualified as type I or II nonskid systems, respectively. Products qualified to composition D are inherently extended qualification approval status to composition G.

4.2.3 General inspection. The coating system's identification characteristics shall be reviewed to ensure conformance to the requirements specified in 3.3.

4.3 Conformance inspection. Conformance inspection shall consist of the conformance tests specified in table IX. At a minimum, conformance inspection shall be performed on the first lot and every 5,000 gallons (19,000 liters) thereafter. For the purpose of conformance inspection, a lot shall consist of an individual nonskid system coating of the same type, composition, class, grade, and application from a single, uniform batch or a uniform blend of batches offered for delivery at one time. Conformance testing of the first lot and every 5,000 gallons (19,000 liters) thereafter of color topping shall be determined by the cumulative, total volumes of all colors of color topping produced by the manufacturer. Conformance testing is required on only one color of color topping. Color topping conformance inspections shall be conducted on any lot of white or yellow color topping.

4.4 Preparation for testing.

4.4.1 Standard conditions. Unless otherwise specified herein, standard conditions shall conform to ASTM D3924, except that the temperature shall be 75±5 °F (24±2 °C) and the relative humidity shall be less than 85 percent.

4.4.2 Panel substrate material. Panels in accordance with 4.4.2.1 shall be used for all tests which require steel panels. Panels in accordance with 4.4.2.2 shall be used for all tests which require elastomeric substrates for submerged applications. Panels in accordance with 4.4.2.3 shall be used for all tests which require aluminum panels.

4.4.2.1 Steel test panels (applications 1 and 3). Ordinary strength steel panels, in accordance with grade A of MIL-S-22698, ¼-inch (6-millimeters) (nominal) thick (unless a different thickness is specified in the test method [see 4.5.9, 4.5.14, and 4.5.17]) shall be abrasive-blasted to an SSPC-SP 10, near-white metal cleanliness, with a 3- to 6-mil (75- to 150-micrometer) angular profile. Surface profile shall be measured in accordance with ASTM D4417. Panels shall meet the cleanliness requirements of SSPC-SP 10 and SSPC-SP 1 immediately prior to nonskid system application.

4.4.2.2 Elastomeric substrates (class 5). As required by the qualifying activity, NAVSEA will apply, test, and validate performance of the nonskid system applied to elastomeric substrate panels.

4.4.2.3 Aluminum test panels. Aluminum panels shall conform to ASTM B928/B928M for aluminum alloy 5456, temper H116 material and shall be of ¼-inch (6-millimeter) (nominal) thickness and shall be abrasive-blasted with stainless steel grit, aluminum oxide, or garnet media to an SSPC-SP 17 level of cleanliness with a 3- to 6-mil (75- to 150-micrometer) angular profile. Surface profile shall be measured in accordance with ASTM D4417. Panels shall meet the cleanliness requirements of SSPC-SP 17 and SSPC-SP 1 immediately prior to nonskid system application.

4.4.3 Preparation of nonskid system test panels. Panels shall be prepared as specified in 4.4.2.

4.4.3.1 Temperatures. Unless subject to low temperature testing (see table V), all nonskid system coatings (primer, underlayment, nonskid, and color topping) shall be conditioned for a minimum of 24 hours at standard conditions in accordance with 4.4.1 prior to use. Unless subject to low temperature testing (see table V), all application 1 and 2 coatings shall be mixed, inducted in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2), if applicable, applied, and cured at standard conditions in accordance with 4.4.1. Application 3 coatings shall be mixed and inducted in accordance with the NAVSEA-reviewed ASTM F718 data sheet (and, if applicable, at standard conditions, and applied and cured at less than or equal to 35 °F [2 °C]). Applications 1 and 3 nonskid systems shall be cured for a minimum of 14 days and a maximum of 30 days prior to testing. The entire application 2 nonskid system shall be cured for a maximum of 72 hours prior to testing. The ambient temperature and relative humidity ranges during conditioning, induction if applicable, mixing, coating application, and curing shall be recorded.

4.4.3.2 Primer. Primer shall be applied to test panels prepared in accordance with 4.4.2 in accordance with the application thickness requirements and using the type of coating application equipment cited in the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). If a range is given for the primer thickness, the minimum thickness shall be used for testing purposes except for the test in 4.5.3 where the maximum thickness shall be used. If a range is not given, then the primer thickness shall be ±1 mil (±25 micrometers) of the manufacturer's NAVSEA-reviewed ASTM F718 data sheet recommended thickness. Prior to application of any follow-on layer, the primer shall be allowed to cure sufficiently in accordance with the NAVSEA-reviewed ASTM F718 data sheet, and the primer dry film thickness (DFT) shall be measured in accordance with SSPC-PA 2. The total cure time (from primer application through test initiation), overcoat times, and all thickness measurements of the primer shall be recorded.

4.4.3.3 Underlayment (class 4). Underlayment shall be applied to primed test panels prepared in accordance with 4.4.2 in accordance with the type of coating application equipment cited in the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). Underlayment shall be applied to a minimum thickness of ⅛ inch (3 millimeters). The total cure time (from application through test initiation) of the underlayment shall be recorded. For panels that are not used for coverage of underlayment in accordance with 4.5.9, coverage in square feet per gallon (square meters per liter) for the underlayment shall be estimated by weight or volume and recorded.

4.4.3.4 Nonskid. Nonskid shall be mixed using a hand-held power mixer or an A-A-59984-automated mixer in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). Nonskid shall be mixed at the maximum mixer rotational speed and for the minimum time required in the NAVSEA-reviewed ASTM F718 data sheet. Nonskid shall be applied using the equipment in accordance with the NAVSEA-reviewed ASTM F718 data sheet for the nonskid type being qualified. Types I, III, and V rollable nonskid shall be applied using a napless roller such that the ridges run parallel to the long axis of the test panel. Types II, IV, and VI sprayable nonskid shall be applied using a progressive cavity pump and spray gun system per A-A-59982. Rolled and sprayed nonskid shall be applied in a uniform and consistent manner to achieve the required coverage cited in table IV. Nonskid coverage shall be calculated in accordance with 4.5.9. Coverage for all other test panels shall be estimated by weight or volume and recorded.

4.4.3.5 Color topping. Color topping shall be applied directly to primer panels prepared in accordance with 4.4.3.2 in accordance with the application thickness requirements and using the type of coating application equipment cited in the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). If the NAVSEA-reviewed ASTM F718 data sheet does not cite a film thickness range, color topping thickness shall be ±1 mil (±25 micrometers) of the thickness cited in the NAVSEA-reviewed ASTM F718 data sheet. The color topping DFT shall be measured in accordance with SSPC-PA 2 after cure-to-full-service of the color topping. A minimum of three thickness measurements shall be taken for each panel. Color topping panels shall be cured in accordance with the NAVSEA-reviewed ASTM F718 data sheet prior to testing. The total cure time from application through test initiation and all thickness measurements of the color topping shall be recorded.

4.4.4 Preparation of nonskid panels for color (class 2), gloss (class 2), and TSR.

4.4.4.1 Neat test panels. Samples of neat nonskid shall be made by straining the aggregate out of a thoroughly mixed nonskid using a 100 mesh filter bag (or equivalent), or the nonskid may be manufactured without aggregate. The neat nonskid shall be applied in accordance with ASTM D823 method C or method E using a film applicator to produce a WFT of 8 mils (200 micrometers). The nonskid shall be allowed to cure in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2) under standard conditions. The paint specimen shall be cured for a minimum of 14 days and a maximum of 30 days before further testing.

4.4.4.2 Free film test panels. Samples of nonskid (with aggregate) shall be made by spreading the nonskid evenly over a piece of free film release paper with a tongue depressor to create a nonskid free film that is approximately 4 by 4 by 3/16 inches (100 by 100 by 5 millimeters) (nominal) when cured. The nonskid shall be allowed to cure in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2) under standard conditions. The free film shall be peeled off of the release paper and the smooth side shall be used for testing.

4.5 Tests. Tests shall be conducted in accordance with the procedures specified herein. Each result shall be compared with the applicable requirement in section 3 and evaluated for qualification (see table IX). Resistance to corrosion (see 4.5.8) performance evaluations shall be conducted on the entire coated test panel surface but shall exclude corrosion or undercutting within 1 inch of the panel edge.

4.5.1 COF. Three steel panels shall be prepared with dimensions of 18 by 18 by ¼ inches (450 by 450 by 6 millimeters) (nominal) in accordance with 4.4.2.1. The three test panels shall be coated with the nonskid system in accordance with 4.4.3, excluding color topping. The static COF shall be measured using the sliding block meter for dry and wet substrates in accordance with 4.5.1.1. The dynamic COF shall be measured using the rotating arm meter for dry and wet substrates in accordance with 4.5.1.2. The COF results shall conform to the requirements of 3.4.

4.5.1.1 Static COF. The static (or sliding block) COF shall be determined in accordance with the requirements of 3.4.1.

4.5.1.1.1 Static COF test device. The COF testing device shall be constructed of the following components:

a. A drag sled that shall be constructed of a steel block having dimensions of 5.75 by 4 by 0.85 inches (145 by 100 by 22 millimeters) (nominal), with one 4-inch (100-millimeter) edge having a 0.75-inch (19-millimeter) radius. The 4- by 0.85-inch (100-millimeter by 22-millimeter) face with the radius edge shall also receive a screw eye in the center of the face and shall be covered with a vulcanized neoprene rubber pad. The rubber pad shall have a nominal thickness of ⅛ inch (3 millimeters) and shall be composed of ultra-strength multipurpose neoprene with material certification of nominal durometer hardness 60A (medium hard) conforming to ASTM D2000. The total weight of the drag sled including the rubber pad and screw eye shall be 6.0±0.5 pounds (2.7±0.2 kilograms).

b. A force gage shall be used which can measure at least 10 pounds (4.5 kilograms) with a minimum resolution of 0.02 pound (0.01 kilogram). The gage shall also be able to output information to a personal computer for analysis. See 6.8 for more information.

c. A computer program that can collect and save data from the force gage, as well as analyze the data to determine the COF at the moment at which motion begins (static friction), shall be used.

d. A platform that supports the force gage and can pull the drag sled a minimum of 1 inch (25 millimeters) along the deck or test panel at a constant speed of 12 to 13 inches (300 to 325 millimeters) per minute.

e. A stable, level, flat bench or work surface to which the platform and test panels can be affixed in a manner that will allow consistent COF data collection.

4.5.1.1.2 Static COF test procedure. The test shall be conducted on two panels. One of the panels shall be conditioned with 50 cycles in accordance with the cable abrasion test in 4.5.2 prior to COF testing. The other panel shall be worn with 500 cycles in accordance with the cable abrasion test in 4.5.2 prior to COF testing. The "conditioned " and "worn" COF panels shall be subjected to this test procedure under the following two conditions in the sequence shown below:

Dry - COF test shall first be performed on each panel.

Wet - After completion of the dry COF test, the panels shall be uniformly wetted with synthetic seawater in accordance with ASTM D1141 from a spray bottle until the synthetic seawater runs off the side of the panel surface. The static COF test shall be performed on each panel immediately after uniform wetting with synthetic seawater.

The following test procedure shall be performed:

a. Place the sled with the rubber side down on the test panel and connect it to the force gage in such a way that no tension is applied to the force gage while minimizing slack between the force gage and the sled. A rigid rod is useful in accomplishing the required sled placement.

b. Move the sled across the panel at a rate of approximately 12 inches (300 millimeters) per minute. The sled should move for approximately 5 seconds to give a travel distance of 1 inch (25 millimeters).

c. Determine the COF by dividing the force required to initiate the movement of the sled by the weight of the sled. Record the COF results.

d. Make three spot measurements per panel in three different areas. A spot measurement is the average of five replicate COF readings parallel to the nonskid ridges and five replicate COF readings perpendicular to the nonskid ridges. The nonskid COF value is the average of the three spot measurements and shall conform to the requirements of 3.4.1.

4.5.1.1.3 Sliding block COF sled calibration. Since friction readings are a function of the surface condition of the steel sled rubber surface, a steel sled with a new, vulcanized neoprene rubber pad shall be used for each product tested. In addition, sleds used for the different test conditions shall be used only for the same conditions. That is, a sled used dry shall only be used to test dry friction specimens, sleds used with water shall be used only with water friction specimens, and sleds used to measure oily friction shall only be used to test oily friction specimens. Sleds shall be calibrated against a flat steel block having machined, cross-hatched, v-shaped grooves with a nominal depth of 0.05 inch (1.27 millimeters) and a nominal groove peak-to-peak distance of 0.01 inch (0.25 millimeter). Sleds may continue to be used in testing the same product until repeat measurements on the calibration surface change by more than ±5 percent. All calibrations shall be performed on the same calibration block since the intent of the calibration blocks is only to determine reproducibility of readings by the rubber pad and, thus, rubber pad replacement criteria. Calibration of sleds on different calibration blocks during the determination of friction values on a test specimen is not permitted. Calibration shall be performed before and after test specimen friction determinations and the values obtained recorded and reported with the test value.

4.5.1.2 Dynamic COF. The dynamic (or rotating arm) COF shall be determined in accordance with the requirements of 3.4.2.

4.5.1.2.1 Dynamic COF test device. The dynamic COF testing device shall be Vision Point Systems Inc., μ-Deck Rotating Arm COF Meter, or equivalent as approved by NAVSEA (see 6.13).

4.5.1.2.2 Dynamic COF test procedure. The test shall be conducted on one panel. The COF test panel shall be in the as-applied state and shall not have been subjected to nonskid conditioning or wear cycles before testing. The as-applied test panel shall be subjected to this test procedure under the following two conditions in the sequence shown below:

Dry - COF test shall be performed on each panel.

Wet - After completion of the dry condition test, the panels shall be uniformly wetted with synthetic seawater per ASTM D1141 from a spray bottle until the synthetic seawater runs off the side of the panel surface. Perform dynamic COF test on each panel immediately after uniform wetting with synthetic seawater.

The serial number of the dynamic COF meter used in this procedure shall be recorded. The dynamic COF meter shall be used in accordance with the manufacturer's directions and the following test procedure shall be performed:

a. Unlock the ball holder and insert the contact ball into the holder ensuring that the surface that will be in contact with the surface to be measured has not been used for a previous measurement. Lock the ball into the ball holder.

b. Place the COF meter on the test panel ensuring that the ball will remain in contact with the surface of the test panel throughout the full 360 degree rotation of the contact ball.

c. Measure and record the surface temperature (T_s), in degrees Fahrenheit, of the nonskid panel. The surface temperature of each COF reading shall be recorded.

d. Measure the uncorrected COF (COF_U), in accordance with the COF meter manufacturer's instructions. COF_U shall be recorded.

e. Calculate the temperature corrected COF (COF_C), in accordance with the following equation:

$$COF_C = COF_U - 0.0048\ (75 - T_s)$$

f. Calculated COF_C – The calculated COF_C shall conform to the requirements of 3.4.2.

4.5.1.2.3 Dynamic COF meter calibration. The COF meter shall be calibrated in accordance with the manufacturer's directions whenever a new contact ball is inserted.

4.5.2 Wear of arresting cable (composition L). Three 12- by 6- by ¼-inch (300- by 150- by 6-millimeter) (nominal) steel test panels prepared in accordance with 4.4.2.1 shall be coated in accordance with 4.4.3 with the nonskid system. Each panel shall be conditioned by running 50 cycles in the arresting cable wear test apparatus in accordance with 4.5.2.1 before determination of the wear of the arresting cable. Each panel shall then be worn by a new cold-rolled ASTM A229/A229M class 2 steel rod of ⅛- to ⅜-inch (3- to 9-millimeter) diameter and of sufficient length to completely span the width of the sample plate. Before use, the diameter of each rod shall be measured to the nearest 0.1 mil (2.5 micrometers) in a minimum of ten places that will come in contact with the test panel. After completion of 200 cycles in the arresting cable wear test apparatus, the rod shall be removed from the jig and the diameter of the rod shall be measured to the nearest 0.1 mil (2.5 micrometers) in approximately the same places as measured before the rod was worn. The mean difference in thickness of the rod shall be computed and that number shall be recorded as the wear value for that rod. The average wear of the three rods shall be computed, and this value shall be used to determine conformance to the requirements specified in 3.5. The device used for the measurement of the rods shall have a minimum precision of 0.1 mil (2.5 micrometers) and shall be capable of measuring an irregular surface. One device that has the necessary measurement capability that may be used for the measurement of the rods is a Nikon Instruments Inc. V-12B profile projector. Equivalent devices may be used. The average wear of the three rods and the device used for measurement shall be recorded.

4.5.2.1 Arresting cable wear test apparatus. The test apparatus shall be constructed such that there will be relative motion between the steel rod and the test panel. It shall have the following features:

a. A carriage or jig on which either the test panel or the steel rod is mounted. The test panel and the rod shall be securely fastened to preclude movement within the carriage or jig during the test and to allow a 30- to 90-pound load to be applied normal to rod/panel contact interface. Either the rod, or the test panel, shall be moved in a reciprocating motion between 9 inches (225 millimeters) along the 12-inch (300-millimeter) dimension of the sample panel and 15 inches (380 millimeters) along the 18-inch (450-millimeter) COF test panels cited in 4.5.1.

b. The steel rod shall be in contact with the test panel, with the axis of the rod horizontal and at a right angle to the direction of the reciprocating motion. The clamps holding the rod shall not come into contact with the test panel, and shall not permit the rod to bend, twist, or rotate during the test. The test apparatus shall be constructed such that the contact force between the rod and the sample is 30±¼ pounds (13.6±0.1 kilograms) when testing the 12- by 6-inch panels and 90±¼ pounds (40.8±0.1 kilograms) when testing the 18- by 18-inch COF test panels cited in 4.5.1.

4.5.3 Impact resistance. Four steel test panels shall be prepared that are 6 by 6 by ¼ inches (150 by 150 by 6 millimeters) (nominal) in accordance with 4.4.2.1. Panels shall be coated with the complete nonskid system of the type being qualified in accordance with 4.4.3. The back and sides of two of the four steel panels shall be coated with one coat of nonskid primer to prevent corrosion and delamination during the seawater immersion treatment. Immediately before testing, two steel panels shall be subjected to each of the following treatments:

a. No treatment, and

b. 15 days of immersion in either natural seawater or synthetic seawater in accordance with ASTM D1141.

Failure of any one of the test panels constitutes failure of this test.

4.5.3.1 Impact test apparatus. The impact test shall be conducted with a device similar to that depicted in ASTM G14, except that the v-block securing device shall be replaced with a steel base that is at least 1.5 inches (40 millimeters) thick, is capable of securing the sample plate without allowing movement when impacted, and allows alignment of the plate with the designated impact locations. The tup nose shall have a ⅝-inch (15.875-millimeter) hemispherical head and the weight of the tup shall be modified so that it is 4.0 pounds (1.8 kilograms).

4.5.3.2 Impacting the sample. Immediately upon removal from treatment, each panel shall be subjected to 25 impacts by the tup dropped from a distance of 4.0 feet (1.2 meters). The impacts on the panel shall be made in the sequence specified on figure 1. Successive points of impact shall form a 5 by 5 pattern, enclosed within an area of about 9 square inches (58 square centimeters), in which the impacts are equally spaced ¾±1/16-inch (20±1.5-millimeters) center-to-center from their nearest neighbors.

2	15	11	7	3
6	19	23	20	16
10	22	25	24	12
14	18	21	17	8
1	5	9	13	4

FIGURE 1. Impact sequence for the impact resistance test.

4.5.3.3 Removal of loosened nonskid. Upon completion of the impact sequence in accordance with 4.5.3.2, the panel shall be probed with a hand-held, sharpened, 1-inch (25-millimeter) (nominal) steel, cold chisel in an area at least 1 inch (25 millimeters) beyond the edge of the 9-square inch (58-square centimeter) area shown on figure 1 to determine the amount of force needed to remove the coating and expose the steel substrate. The panel shall then be probed in the impact area and the area between impact points with the chisel, using a force less than that required to remove the coating completely to dislodge any nonskid delaminated from the substrate by the impact test. Remove all nonskid fragments or chips created by the probing with the chisel.

4.5.3.4 Evaluation. The percentage of the nonskid system remaining intact and tightly adhering to the panel after 25 tup impacts shall be evaluated using the following assessment process: In the 5 by 5 pattern of impacts, there are 40 pairs of impacts separated by ¾ inch (20 millimeters) of the nonskid system as measured from the center of one tup impact to the center of an adjacent tup impact. Each of these ¾-inch (20-millimeter) areas shall be inspected. If one or more layers of the nonskid system delaminates from the layer below or the entire nonskid system delaminates from the substrate, so as to connect one pair of impacts, the percentage of intact coating system shall be reduced by 2.5. Thus, a passing value of 95 percent indicates that no more than two pairs of adjacent impacts showed completely exposed primer or substrate. If the rating for any one of the four steel panels is less than 95 percent, the nonskid system will have failed the impact test. Impact resistance for each type shall be in accordance with the requirements of 3.6.

4.5.4 Resistance to wear. Three steel panels with dimensions of 12 by 6 by ¼ inches (300 by 150 by 6 millimeters) (nominal) shall be prepared in accordance with 4.4.2.1. The three test panels shall be coated in accordance with 4.4.3 with the nonskid system. The mass of each panel shall be measured to the nearest 0.001 pound (0.5 gram) before application of the coating system. Each coated panel shall be initially abraded by the arresting cable wear test apparatus specified in 4.5.2.1 for 50 cycles and then its mass shall be determined. The panel shall then be worn for an additional 450 cycles in the cable abrasion tester for types I through IV nonskid and an additional 750 cycles for types V and VI nonskid. The wire in the arresting cable wear test apparatus shall be replaced after the first 50 cycles and every 150 cycles thereafter. The final panel mass shall be taken at the end of the wear test. The percent mass loss for each test panel shall be calculated as follows:

$$Percent\ mass\ loss = 100 \times \frac{(M2 - M3)}{(M2 - M1)}$$

M1 = Mass of uncoated panel

M2 = Mass of coated panel at 50 cycles

M3 = Mass of coated panel at end of test

The average percent mass loss of the three test panels shall be computed. Panel weight, weight of coating system after initial wear testing, weight of coating system after final wear testing, percent mass loss for each panel, and the average percent mass loss shall be recorded. Resistance to wear shall conform to the requirements of 3.7.

4.5.5 Flash point. The flash point shall be determined in accordance with ASTM D3278 on each individual coating and coating component of the nonskid system after each has been mixed in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). Flash point of each coating or coating component of the nonskid system shall be in accordance with the requirements of 3.8.

4.5.6 Resistance to chemical solutions.

4.5.6.1 Nonskid panels (types I, II, V, and VI). Fourteen steel panels with dimensions of 6 by 2 by ¼ inches (150 by 50 by 6 millimeters) (nominal) shall be prepared in accordance with 4.4.2.1. The front of the steel panels shall be coated with the nonskid system of the type being qualified in accordance with 4.4.3.

4.5.6.2 Color topping panels. Fourteen steel panels with dimensions of 6 by 2 by ¼ inches (150 by 50 by 6 millimeters) (nominal) shall be prepared by abrasive blasting in accordance with 4.4.2.1. The fourteen steel panels shall be coated with primer in accordance with 4.4.3.2. The primed panels shall be coated with color topping in accordance with 4.4.3.5.

4.5.6.3 Test procedure. Seven of the fourteen steel panels in accordance with 4.5.6.1 and seven of the fourteen steel panels in accordance with 4.5.6.2 shall include a 4- by ¼-inch (100- by 6-millimeter) (nominal) linear scribe in the nonskid system that exposes the substrate. The scribe may be created by cutting through the nonskid system in accordance with ASTM D1654 or by masking the area before coating application (see 6.9). Sets of one scribed and one unscribed steel panel in accordance with 4.5.6.1 and sets of one scribed and one unscribed steel panel in accordance with 4.5.6.2 are to be placed into each one of seven, wide-mouth jars with tightly-fitting caps that shall be filled to a depth of 3 inches (76 millimeters) (nominal) with one of the following chemical solutions such that four panels are in each jar:

a. Flight deck nonskid cleaner in accordance with MIL-PRF-32177, 6 percent solution in synthetic seawater.

b. JP-5 jet fuel in accordance with MIL-DTL-5624.

c. Hydraulic fluid in accordance with MIL-PRF-83282.

d. Aircraft engine turboshaft lubricating oil in accordance with MIL-PRF-23699.

e. Detergent in accordance with MIL-D-16791, 0.5 percent solution in synthetic seawater in accordance with ASTM D1141.

f. Fire extinguishing agent, aqueous film-forming foam in accordance with MIL-PRF-24385, 10 percent solution in synthetic seawater in accordance with ASTM D1141.

g. Deicing-defrosting fluids in accordance with SAE-AMS1424.

The four panels, one scribed nonskid panel and one unscribed nonskid panel, along with one scribed color topping panel and one unscribed color topping panel, shall be placed vertically in each jar such that each panel rests on its 2-inch (50-millimeter) side, with one-half of each panel immersed and one-half above the test chemical solution, fuel, fluid, or lubricant, such that the candidate-coating surface of the four panels is oriented toward the center of the jar. The jars shall be sealed tightly and kept at standard conditions for 4 weeks for all chemical solutions, except JP-5 and deicing-defrosting fluid, which shall be kept at standard conditions in accordance with 4.4.1 for 24 hours.

After the prescribed chemical solution exposure periods, the coated test panels shall be removed from the jars and residual chemical solution shall be removed by daubing the test panels with clean, lint-free laboratory wipes. Immediately after residual chemical solution removal, each panel exposed to flight deck nonskid cleaner, hydraulic fluid, aircraft engine turboshaft lubricating oil, detergent, and aqueous film-forming foam shall be probed with a dull, 1-inch (25-millimeter) (nominal) wide putty knife on the portion of the panel that was immersed in the chemical solution and the portion of the panel that was not immersed in the chemical solution to determine if there is any softening, loss of adhesion, separation between coats of the system, discoloration, or other signs of deterioration. After removal of the residual chemical solution via daubing as described above, each panel exposed to JP-5 and deicing-defrosting fluids shall be allowed to rest at standard conditions for a maximum of 6 hours before inspection to determine signs of deterioration as described above.

If scribe corrosion is observed on a test panel exposed in any of the chemical solutions, fuels, fluids, or lubricants, the scribe area of each panel shall be prepared and inspected in accordance with ASTM D1654 for corrosion, undercutting, and loss of adhesion. Evaluation results shall satisfy the requirements for resistance to chemical solutions in accordance with 3.9. The specific tradenames of the chemical solutions, fuels, fluids, or lubricants and associated manufacturers used in this test shall be recorded.

4.5.6.4 Types III and IV. Six steel panels shall be as described, as prepared prior to coating, and as coated in accordance with 4.5.6.1. Three of the six panels shall be scribed in accordance with 4.5.6.3. Sets of one scribed and one unscribed test panel shall be immersed in solutions (c), (e), and (f), and shall be tested and evaluated in accordance with 4.5.6.3. Results of the evaluation shall be in accordance with the requirements of 3.9.

4.5.7 Resistance to accelerated aging by light and water. Six 12- by 6- by ¼-inch (300- by 150- by 6-millimeter) (nominal) steel test panels in accordance with 4.4.2.1 shall be prepared in accordance with the following: three panels shall be coated with the nonskid system in accordance with 4.4.3 and three panels shall be prepared with the color topping in accordance with 4.4.3.5. Two of the three nonskid system panels and two of the three color topping panels shall be subjected to two impacts from the impact tester in accordance with 4.5.3; each impact shall be 1 inch (25 millimeters) (nominal) from the bottom edge (6-inch-dimension) and 1.5 inches (40 millimeters) (nominal) from the sides of the panel (12-inch-dimension). For class 2, three additional 6- by 3- by ⅛-inch (150- by 75- by 3-millimeter) (nominal) steel test panels in accordance with 4.4.2.1 shall be prepared with the nonskid system in accordance with 4.4.4.1 and the initial color shall be measured in accordance with 4.5.10.2. All six test panels for classes 1, 3, 4, 5, 6, and 7, or all nine test panels for class 2 shall be tested in accordance with ASTM G154, cycle 1 (UV-A) for 500 hours in an accelerated weathering tester. Panels shall be evaluated in accordance with ASTM D661 for cracking (all classes), ASTM D660 for checking (all classes), ASTM E1347 for color difference (class 2), and ASTM D4214 for chalking (class 2). The actual exposure time for all panels as well as the ASTM D661, ASTM D660, ASTM E1347, and ASTM D4214 ratings shall be recorded. At the completion of the exposure period, the panels shall be evaluated for compliance with 3.10.

4.5.8 Resistance to accelerated corrosion and sequential accelerated corrosion.

4.5.8.1 Resistance to accelerated corrosion (types I through IV). Two steel test panels in accordance with 4.4.2.1 and two aluminum test panels in accordance with 4.4.2.3 with dimensions of 12 by 6 by ¼ inches (300 by 150 by 6 millimeters) (nominal) shall be prepared for coating with the nonskid system in accordance with 4.4.3 and include a 5 ¾- by ¼-inch (145- by 6-millimeter) (nominal) linear scribe in the nonskid system that exposes the substrate. The scribe shall be parallel to the long axis of the panel and shall be centered on each panel. The scribe may be created by cutting through the nonskid system in accordance with ASTM D1654 or by masking the area before coating application. The two steel and two aluminum test panels shall be subject to accelerated corrosion for 1,000 hours in a salt fog cabinet in accordance with ASTM B117. Upon completion of the accelerated corrosion exposure, the test panels shall be removed from the salt fog cabinet, rinsed in potable water, and dried with lint-free laboratory wipes. Immediately after the residual rinse water has been removed, the scribe area of each panel shall be prepared and inspected in accordance with ASTM D1654 for separation between layers, loss of adhesion, undercutting, and corrosion. The panels shall satisfy the requirements of 3.11.1.

4.5.8.2 Resistance to sequential accelerated corrosion (types V and VI). Two steel test panels in accordance with 4.4.2.1 and two aluminum test panels in accordance with 4.4.2.3 with dimensions of 12 by 6 by ¼ inches (300 by 150 by 6 millimeters) (nominal) shall be prepared for coating with the nonskid system in accordance with 4.4.3 and include a 5¾- by ¼-inch (145- by 6-millimeter) (nominal) linear scribe in the nonskid system that exposes the substrate. The scribe shall be parallel to the long axis of the panel and shall be centered on each panel. The scribe may be created by cutting through the nonskid system in accordance with ASTM D1654 or by masking the area before coating application. The two steel and two aluminum test panels shall be subject to sequential testing in accordance with the following four-step sequence. Sequential testing shall begin with the ASTM G154 test (see 4.5.8.2.a.) and shall conclude with the impact resistance test (see 4.5.8.2.d). Test panels may be exposed to standard conditions for a maximum of 72 hours before the next test in the sequence is initiated.

a. ASTM G154, cycle 1 (UV-A) for 1,000 hours.

b. ASTM B117 for 2,000 hours.

c. Abrasion by the arresting cable wear test apparatus in accordance with 4.5.2 for 800 cycles.

d. Impact resistance in accordance with 4.5.3.2. As shown on figure 2, only 20 tup impacts per panel are required. No tup impacts are required in the scribed area. Only consider primer or substrate exposure between the 20 tup impact points in assessing the amount of nonskid that remains intact and adherent in the determination of impact resistance.

Once the tests are concluded, the scribe area of each panel shall be prepared and inspected in accordance with ASTM D1654 for separation between layers, loss of adhesion, undercutting, and corrosion. The test panels shall be evaluated in accordance with the requirements of 3.11.2.

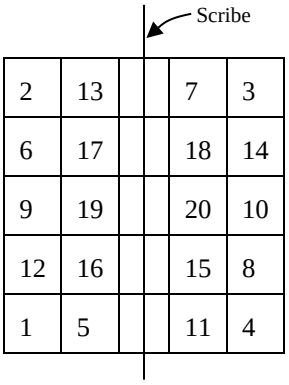

FIGURE 2. Impact pattern.

4.5.9 Mixing, application, coverage, and drying. The mixing, application, drying, and coverage properties of each individual coating of the nonskid system shall be tested in accordance with the requirements herein and shall comply with the requirements of 3.12.

4.5.9.1 Substrate. For types I, III, and V, two 8- by 4-feet by 0.032-inch (minimum thickness) (2,400- by 1,200- by 1-millimeter) (nominal) cold-rolled steel sheets shall be cleaned to the requirements of SSPC-SP 1 for coverage testing in accordance with 4.5.9.3. Plywood sealed with a minimum of one layer of epoxy primer, applied in accordance with the NAVSEA-reviewed ASTM F718 data sheet, or equivalent sheet material, at equivalent dimensions is an acceptable substitution for the 8- by 4-feet by 0.032-inch (minimum thickness) cold-rolled steel sheets. For types II, IV, and VI, two 3- by 3-feet by 0.032-inch (900- by 900- by 1-millimeter) (nominal) cold-rolled steel panels shall also be cleaned to the requirements of SSPC-SP 1 and are required for coverage testing in accordance with 4.5.9.3. The substrate shall be conditioned at each temperature as specified in table V for 4 hours minimum prior to coating application. If environmental conditions cannot be produced to satisfy the high and low temperature requirements of table V due to the large area of the panels indicated in this paragraph, test panels of 12- by 12- by 0.032-inch (300- by 300- by 1-millimeter) (nominal) cold-rolled steel may be used for determination of rolled or sprayed coating application, coverage, and drying properties (see 6.11).

4.5.9.2 Mixing. Coatings shall be conditioned and mixed using unopened, 1-gallon- (3.8-liter) (minimum) sized kits. Test coatings shall be conditioned for 24 hours (minimum) prior to mixing at the high temperature specified in table V for high temperature substrate testing, and at a maximum of the low temperature specified in table V for low temperature substrate testing. Coatings shall be mixed in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). During mixing, coatings shall be evaluated for conformance to the requirements of 3.12. In accordance with the NAVSEA-reviewed ASTM F718 data sheet, the primer, underlayment, and color topping shall be applied before 25 percent of the working life has elapsed. The initiation of nonskid application shall begin within 15 minutes of mixing completion in accordance with the NAVSEA-reviewed ASTM F718 data sheet.

4.5.9.3 Coating application and coverage. Nonskid system coatings shall be applied in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2) and exposed to the high and low temperatures listed in table V within 5 minutes of application completion at standard ambient conditions in accordance with 4.4.1. After primer application, drying, and evaluation, subsequent nonskid system coatings shall be applied to distinct test panels for evaluation. Coatings shall meet the requirements of 3.12 during application.

4.5.9.3.1 Roll or trowel application.

a. One gallon (3.8 liters) of the coating shall be roll- or trowel-applied to both 8- by 4-feet (2,400- by 1,200-millimeter) test panels in accordance with 4.5.9.1 as determined by volume or weight.

b. The nonskid shall be pulled, not pushed, toward the applicator during application to achieve the final texture.

c. The coverage shall be visually evaluated to meet the requirements of 3.12.2 and table IV.

4.5.9.3.2 Spray application.

a. The coating shall be spray-applied to two 3- by 3-feet (900- by 900-millimeter) test panels in accordance with 4.5.9.1.

b. The coating shall be evaluated for coverage using the formula below:

$$Coverage\ (in\ units\ of\ ft^2/\text{gal or } m^2/\text{L}) = \frac{(Area \times \frac{Mass}{Unit\ Volume})}{(Mass\ 2 - Mass\ 1)}$$

Where:

Area = 9 square feet (0.863 square meter)

Mass/unit volume = pounds per gallon or kilograms per liter of the mixed coating (not including container weight)

Mass 1 = weight of panel before application (pounds or kilograms as appropriate)

Mass 2 = weight of panel after application (pounds or kilograms as appropriate)

4.5.9.4 Drying. After conformance to mixing and application requirements in accordance with 4.5.9, each individual coating of the nonskid system shall be allowed to dry at the specified substrate test conditions in table V for the coating, type, composition, class, grade, and application being qualified and shall be evaluated prior to applying the next coat. Primer and underlayment dry time shall include the time from completed application through dry-to-handle as defined by ASTM D1640/D1640M and shall meet the drying time requirements of 3.12.3. Nonskid drying time shall include the time from completed application through drying as defined below and shall be evaluated at the maximum allowed dry times listed in 3.12.3.

a. Pile 16 clean, lint-free laboratory wipes over the specific area where drying is to be evaluated.

b. Place a 5-pound (2.27-kilogram) cylindrical weight with a diameter not exceeding 2.6 inches (66 millimeters) on the pile of 16 lint-free laboratory wipes.

c. After at least 15 minutes, remove the weight and the lint-free laboratory wipes.

d. Inspect all wipes for staining caused by contact with the nonskid. Visible staining on any lint-free laboratory wipe indicates failure of this test under the time/temperature conditions evaluated.

4.5.9.5 Mixing and coverage ridge or texture formation. A minimum of one 5-gallon nonskid pail shall be mixed in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2) and the mixed nonskid shall be verified to be in a smooth, uniform condition that is free of hard pigment settling, aggregate clumping, separation, or persistent foam. The mixed types I, III, and V nonskid shall maintain a textured appearance of parallel rows of raised coating, forming peaks and ridges through curing without sagging or slumping. Types II, IV, and VI nonskid shall maintain a uniform, rough-textured layer of nonskid with no dripping, spattering, or cobwebbing. For each nonskid system being qualified, at least one representative, color photograph of the nonskid ridges or spray-applied nonskid surface texture that includes a 1-foot-long ruler or scale shall be included. The photograph or photographs shall be taken close enough to the nonskid surface such that the entire 1-foot ruler or scale is visible in the image to allow ridge spacing and surface roughness to be evaluated by NAVSEA. The color photograph shall be identified with the nonskid type, the conditioning time, conditioning temperature, mixing time, induction time, time elapsed after induction time (or time elapsed after mixing time if induction is not required) prior to coating application, dry time between layers, dry temperature, and coverage.

4.5.10 Color and gloss.

4.5.10.1 Color and gloss (class 1 and classes 3 through 7). A test sample shall be prepared in accordance with 4.4.3 or 4.4.4. Color toppings shall be mixed in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). The color topping shall be drawn down on separate glass panels, opacity cards, or steel test panels using the maximum recommended WFT in accordance with the NAVSEA-reviewed ASTM F718 data sheet. The sample shall be dried at ambient laboratory conditions for 24 hours after each coat. The nonskid or color topping sample shall be visually compared to the appropriate SAE-AMS-STD-595 color chip. The test results shall conform to the requirements of 3.13.1.

4.5.10.2 Color (class 2). The nonskid test specimen shall be prepared in accordance with 4.4.4.1 or 4.4.4.2. Color toppings shall be mixed in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). The color topping shall be drawn down on separate glass panels, opacity cards, or steel test panels using the maximum recommended WFT in accordance with the NAVSEA-reviewed ASTM F718 data sheet. The specimen shall be dried at ambient laboratory conditions for 24 hours after each coat. The color of the coating shall be determined in accordance with ASTM E1347 using an instrument with a spherical geometry that illuminates the sample diffusely and has an 8-degree detector (Diffuse/8°). The sample shall be illuminated using a D_{65} light source with a 10-degree observer angle (D_{65}/10°) and measured in specular-included mode to minimize the effect of gloss and texture. For the colors specified in 3.13.1, the L*, a*, b* color values for the SAE-AMS-STD-595 color chips shall be measured of the color being procured. The mean values of L*, a*, and b* shall be determined for the color cards. These mean values shall be used to calculate the delta E color deviation values. The test results shall conform to the requirements of 3.13.2.

4.5.10.3 Gloss (class 2). The nonskid test specimen shall be prepared in accordance with 4.4.4.2. Color toppings shall be mixed in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). The color topping shall be drawn down on separate glass panels, opacity cards, or steel test panels using the maximum recommended WFT in accordance with the NAVSEA-reviewed ASTM F718 data sheet. The specimen shall be dried at ambient laboratory conditions for 24 hours after each coat. The 60-degree specular gloss shall be determined in accordance with ASTM D523. The test results shall conform to the requirements of 3.13.3.

4.5.11 TSR (class 3). The test specimen prepared in accordance with 4.4.4.1 or 4.4.4.2 shall be used to measure TSR. TSR of the nonskid shall be measured between 250 nm and 2,500 nm in accordance with ASTM E903. The reflectance graph produced by this test shall be recorded. TSR shall be calculated at air mass 1.5 by applying solar weighting factors in ASTM G173. The panels shall be evaluated in accordance with the requirements of 3.14.

4.5.12 Working life (grade B). The nonskid shall be tested in accordance with 4.5.9, except testing shall occur only at standard conditions in accordance with 4.4.1. After mixing, the nonskid for applications 1, 2, and 3 shall be allowed to rest until 95 percent of the manufacturer's specified working life has elapsed. Additionally, for application 1 and 3 coatings, the manufacturer's specified working life shall be not less than 30 minutes. The nonskid shall be applied to test panels immediately after resting for the prescribed duration. The nonskid test panel shall be cure-to-full-service in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2) and shall be tested with dynamic COF apparatus in accordance with 4.5.1.2. The nonskid shall comply with the requirements of 3.15.

4.5.13 Fire resistance. The nonskid system shall be evaluated in accordance with the procedure specified in MIL-STD-1623. The average of three panels shall be used to determine conformance with the requirements of 3.16.

4.5.14 Flexibility (types III and IV, or class 4). Two 12- by 2- by ⅛-inch (300- by 50- by 3-millimeter) (nominal) steel panels shall be prepared in accordance with 4.4.2.1 and coated in accordance with 4.4.3. The type III, type IV, or class 4 nonskid systems shall be mixed, applied to the test panels, and cured in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). The nonskid system test panels shall be tested over a 5-inch (127-millimeter) (nominal) mandrel in accordance with ASTM F137, except bending shall be to 20 degrees at a uniform rate. The panels shall be examined for cracking, breaking, or loss of adhesion immediately after bending. The panels shall be prepared and tested in such a manner that the ridges in the profile of the roll-applied nonskid run parallel to the 12-inch (300-millimeter) length of the panel. Flexibility shall be in accordance with the requirements of 3.17.

4.5.15 Adhesion of the underlayment (class 4). Two 12- by 6- by ¼-inch (300- by 150- by 6-millimeter) (nominal) steel test panels shall be prepared in accordance with 4.4.2.1 and coated in accordance with 4.4.3. The nonskid shall not be applied to this test panel. Three replicate adhesion test measurements of the underlayment per test panel shall be determined in accordance with ASTM D4541. Adhesion of the underlayment shall be in accordance with 3.18.

4.5.16 Immersion resistance (type III/class 1 and type IV/class 1). Four 12 by 6 by ¼ inch (300 by 150 by 6 millimeter) (nominal) steel panels shall be prepared in accordance with 4.4.2.1 and coated in accordance with 4.4.3. The edges and backside of the panels shall be primed and coated with an anti-corrosive coating system. Two of the sample panels shall have a 5¾- by ¼-inch (145- by 6-millimeter) (nominal) linear scribe, on a 45-degree angle centered in the bottom half of the panel, exposing the metal substrate. The defect shall be imparted via a scribing method in accordance with ASTM D1654 or via masking. The panels shall then be completely immersed in either natural or ASTM D1141 synthetic seawater for a period of 12 hours. Afterwards, the test panels shall be removed to dry conditions for a period of 12 hours. This cycle shall be repeated for a period of 1 year, during which time the samples shall be inspected at least monthly for failures as noted in 3.19. At the end of the 1-year test period, the sample plates shall be removed, cleaned of any stains, and evaluated to the requirements of 3.19. The scribe area of each panel shall be prepared and inspected per ASTM D1654 for corrosion under the coating system. The panels shall satisfy the requirements of 3.19.

4.5.17 CP compatibility (type III/class 1 and type IV/class 1). Two 12 by 6 by ⅛ inch (300 by 150 by 3 millimeter) (nominal) steel panels shall be prepared in accordance with 4.4.2.1 and coated in accordance with 4.4.3. The edges, backside, and connecting points of the panels shall be primed and coated with an anti-corrosive coating system. Each panel shall be electrically connected to a commercial magnesium anode conforming to ASTM G8 and shall have a ¼-inch (6-millimeter) (nominal) hole drilled through the coating to the metal at the center of the test panel. The electrical resistance between a point on the surface of the anode and the metal in the drilled hole of the test panel shall be less than 0.01 ohm, when checked with an ohm meter. The test panel shall be installed in a modified ASTM G8 test in such a manner as to separate the test panel from the magnesium anode by 24 inches (600 millimeters) (nominal) for a period of 3 months. At the completion of the 3-month test, each test panel shall be inspected for peeling, flaking, blistering, dissolving, or other failure. Lifting, peeling, or undercutting around the drilled hole shall be measured. The panels shall satisfy the requirements of 3.20.

4.5.18 Pressure cycling (type III/class 5 and type IV/class 5). Pressure cycling testing will be conducted to ensure conformance to 3.21 as required by the qualifying activity (see 6.8).

4.5.19 Strippability (type III/class 5 and type IV/class 5). Strippability testing will be conducted to ensure conformance to 3.22 as required by the qualifying activity (see 6.8).

4.5.20 Storage stability.

4.5.20.1 Long-term storage stability. Full, unopened containers constituting the components of the paint or kit (size of the container shall be as specified [see 6.2]) of the nonskid system shall be kept undisturbed for 1 year at standard laboratory conditions in accordance with 4.4.1. Long-term storage stability shall be evaluated by performing the tests in accordance with 4.5.3, 4.5.4, 4.5.5, 4.5.9, 4.5.10, and 4.5.21. The coating shall satisfy the requirements of 3.23.1.

4.5.20.2 Accelerated storage stability. Full, unopened container(s) constituting the components of the paint or kit (size of the container shall be as specified [see 6.2]) of the nonskid system shall be kept undisturbed for a period of 4 weeks at a temperature of 120 °F (49 °C). Accelerated storage stability shall be evaluated after equilibrating the nonskid system at standard conditions in accordance with 4.4.1 by performing the tests in accordance with 4.5.3, 4.5.4, 4.5.5, 4.5.9, 4.5.10, and 4.5.21. The coating shall satisfy the requirements of 3.23.2.

4.5.21 Weight. Three steel test panels that are each approximately 12 by 6 by ¼ inches (300 by 150 by 6 millimeters) shall be prepared as specified in 4.4.2.1. Each prepared panel shall be marked with a code number using a stamp or vibrating pen. The tare weight of each prepared panel shall be measured to the nearest 0.0002 pound (0.1 gram) and the specific weight for each specific panel shall be recorded. The surface area of the front face of each test panel shall be measured to the nearest 0.02 square inch (0.1 square centimeter). The nonskid system shall be applied to the front face of each panel in accordance with 4.4.3. No primer or nonskid shall be applied to the back or sides of the test panels. Before the nonskid is completely cured, any nonskid residue shall be scraped from the panel edges. The nonskid system shall be allowed to cure in accordance with the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). Each panel shall be weighed to the nearest 0.0002 pound (0.1 gram) and the recorded tare weight shall be subtracted to determine the weight of the nonskid system on each panel. The weight of the nonskid on each specific test panel shall be divided by the measured area of each panel to produce a weight per unit area for the nonskid. The three weight-per-unit areas shall be averaged and conformance with the requirements of 3.24 shall be determined.

4.5.22 Resistance to atmospheric and high-temperature exposure (composition D/class 7). Three 12- by 6- by ¼-inch (300- by 150- by 6-millimeter) (nominal) panels shall be fabricated from high-strength ASTM A514/A514M steel. The three high-strength panels shall be abrasive-blasted in accordance with 4.4.2.1. The three abrasive-blasted panels shall be coated in accordance with 4.4.3. Additionally, 1 inch (25 millimeters) (nominal) along both 6-inch (150-millimeter) (nominal) edges of the plate shall be masked off after the nonskid primer has cured. The nonskid shall then be rolled parallel to the 6-inch (150-millimeter) length of the panel, and the masking tape removed (as soon as practical after nonskid application) in order to provide a smooth contact area for the major-span rollers of the four-point bend fixture described below. Figures 3 and 4 provide examples of masking and nonskid ridge orientation with respect to panel dimensions.

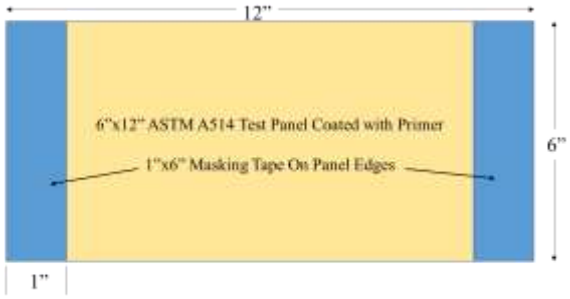

FIGURE 3. Example drawing of a four-point bend test panel that has been primed with masking tape applied.

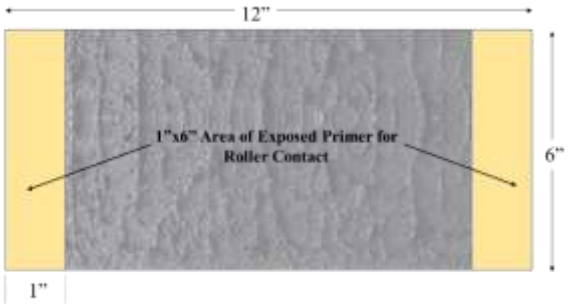

FIGURE 4. Example drawing of a four-bend test panel after masking tape has been removed, showing nonskid ridge orientation.

4.5.22.1 Accelerated aging by light and water. The three panels shall initially be conditioned in accordance with ASTM G154, cycle 1 (UV-A) for 250 hours.

4.5.22.2 Temperature and corrosion cycling. After conditioning in accordance with 4.5.22.1, the three test panels shall be subjected to 15 cycles of temperature cycling and accelerated corrosion testing. One cycle consists of two heated bend tests (HBT) followed by 24 hours of salt spray in accordance with ASTM B117. To perform an HBT, the test panels are placed in a four-point bend fixture, as described in 4.5.22.2.1, and then placed in a convection oven equipped with an exhaust fan to achieve a panel temperature of 400 °F (204 °C) that shall be maintained for 30 minutes. The oven and four-point bend fixtures (fixture only) may be preheated inside the oven prior to loading the panels into the fixtures to minimize the time to achieve the required panel temperature. After heating, the test panels shall be cooled to standard conditions in accordance with 4.4.1. This heating and cooling cycle constitutes one HBT. After two HBTs have completed, the test panels shall be exposed to continuous salt spray in accordance with ASTM B117 for 24 hours. The maximum amount of time that shall elapse between consecutive HBTs or placement in ASTM B117 is 72 hours. This process shall be repeated for 15 cycles, or until a total of 30 HBTs and 360 hours of ASTM B117 have been performed. The three test panels shall satisfy the requirements of 3.25 as required by the qualifying activity (see 6.8).

4.5.22.2.1 Description of four-point bend fixture. The four-point bend fixture shall be an apparatus that enables four-point bending to be accomplished in the confines of a high-temperature oven environment. The panels shall be oriented so that the face coated with nonskid is in tension. The fixture shall have the capacity to achieve a deflection of 0.5625 inch (14 millimeters) (nominal). The fixture shall be capable of maintaining this deflection in a 400 °F (204 °C) environment. An example of such a device is depicted on figure 5. The distances of the minor and major spans of this fixture are 4 inches and 10.5 inches (100 millimeters and 267 millimeters) (nominal), respectively. See 6.8 for more information.

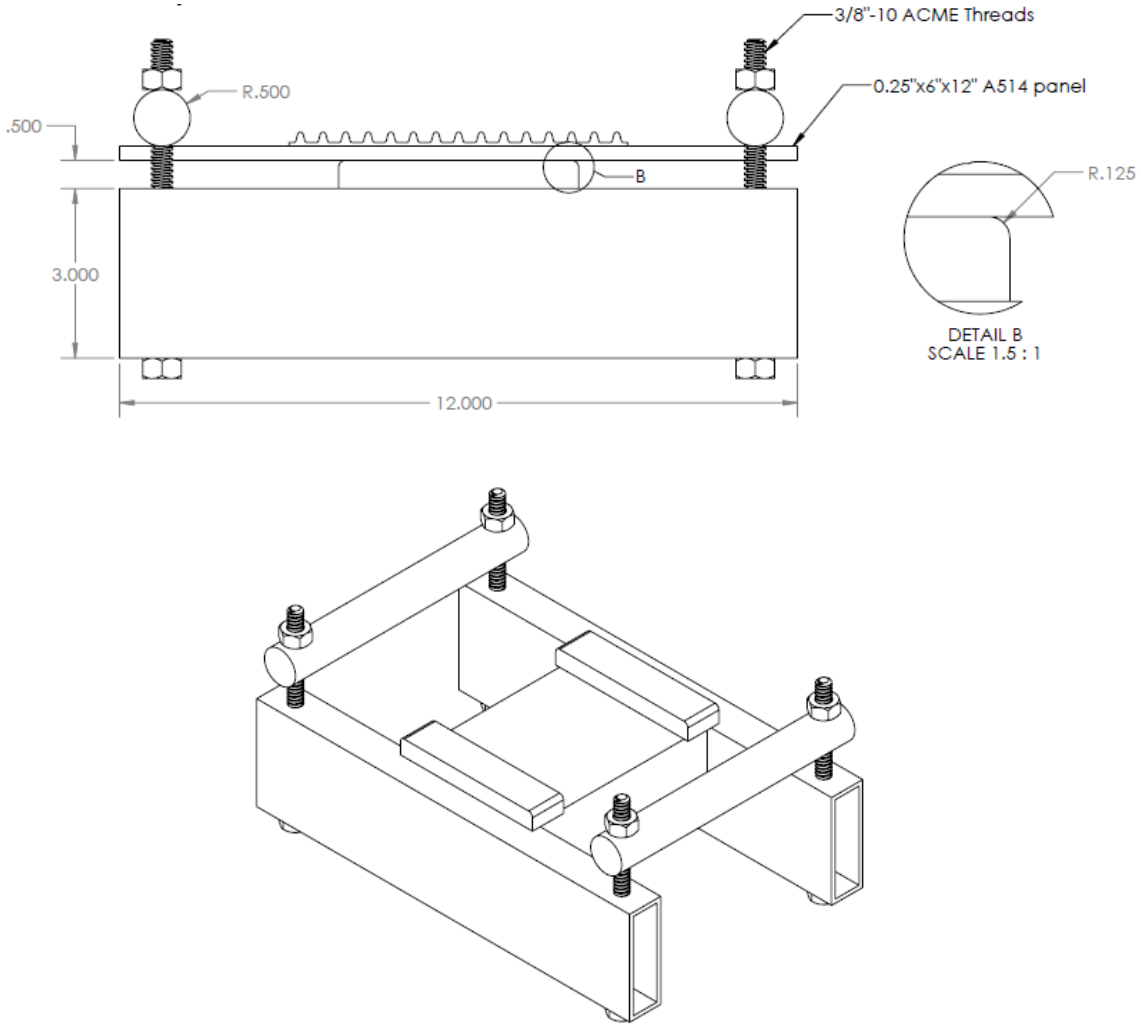

FIGURE 5. Side view (top) and final assembly (bottom) drawing of the four-point bend fixture.

4.5.23 Aggregate density (composition D). The blend density of the aggregate shall be evaluated in accordance with ASTM D1895, method B. The aggregate blend density shall conform to the requirement of 3.2.7.

4.5.24 Aggregate hardness (composition D). A random sample of 5 grams of aggregate shall be selected, and, if comprised of multiple aggregate types, shall be separated by aggregate type. For each aggregate type, a minimum of three grains of aggregate shall be placed between two microscope slides. While wearing appropriate safety gloves and applying considerable finger pressure, one slide shall be slowly moved over the other with a reciprocating motion for 10 seconds. The glass surface shall be examined and, if not scratched, the aggregate shall be considered to have a Mohs value of 6 or less. This shall be repeated for each aggregate type previously separated. The samples shall conform to the requirement of 3.2.8.

4.5.25 Low profile (class 6). Low profile (class 6) testing will be conducted to ensure conformance to 3.26 as required by the qualifying activity (see 6.8).

4.6 Toxicity. A Health Hazard Assessment (HHA) will be conducted to ensure conformance to 3.2.6, as required by the qualifying activity. The Navy and Marine Corps Public Health Center (NMCPHC) will evaluate the nonskid system using data provided by the manufacturer/distributor to the NMCPHC (see 3.2.6 and 6.10).

4.7 VOC limits. The VOC content of each individual coating of the nonskid system, with all components mixed and in ready-to-use condition, shall be determined in accordance with 40 CFR 60, appendix A-7, method 24, allowing the samples to reside at 72±2 °F (22±1 °C) for 1 to 24 hours prior to conducting the testing. In accordance with method 24, the samples shall be oven-cured at 230±9 °F (110±5 °C) for 1 hour. VOC content shall conform to the requirements of 3.2.2.

4.8 HAP content. The HAP content of each individual coating of the nonskid system shall be measured in accordance with 40 CFR 63, appendix A, method 311 (EPA test method 311). Solvent fractions shall be identified in accordance with ASTM E1252 with the results recorded as percent weight of the total paint. Alternate methods of analysis shall be approved by NAVSEA. When specified (see 6.2), formulation data may be used by manufacturers in lieu of testing to demonstrate compliance with 3.2.3. The formulation data shall have a consistent and quantitatively known relationship to the testing required. Calculation of individual HAP contents can be based on either manufacturer evaluation of batches or supplier data for raw materials used in the product. HAP content shall conform to the requirements of 3.2.3.

4.9 Hazardous pigments and additives.

4.9.1 Metals content. Soluble and total metal content, except that of tantalum and tungsten, shall be determined on pulverized, cured film of each individual coating of the nonskid system in accordance with 40 CFR 261.24(a) and an appropriate test method from EPA SW-846. The soluble metal content and the total metal content shall not exceed the values specified in 3.2.4.1. Tantalum and tungsten soluble metal content and total metal content shall be analyzed as specified in 4.9.1.1. Calculation of individual hazardous metal content may be based on either the manufacturer's testing of batches or the supplier's data for raw materials used in the product. When specified (see 6.2), a formulation value shall be provided that shall not be exceeded when the coating is tested in accordance with this paragraph.

4.9.1.1 Tantalum and tungsten content. The tantalum and tungsten content of the cured film shall be determined using any appropriate spectroscopy test method. The tests shall be conducted per the instrument manufacturer's directions. The test results for tantalum or tungsten shall be in accordance with the requirements of 3.2.4.1.

4.9.2 Crystalline silica content. Crystalline silica (respirable) shall be analyzed in accordance with NIOSH analytical method 7500, with the coating sample treated as a bulk-settled dust. Formulation data may be used by manufacturers in lieu of testing to demonstrate compliance, as specified (see 6.2). The test results for crystalline silica shall be in accordance with the requirements of 3.2.4.2.

4.10 Performance in-service. The service tests shall be conducted as follows:

a. The composition L service test of types I, II, V, and VI shall be conducted on the flight deck of a CVN-class ship in the landing area.

b. The composition G service test of types I, II, V, and VI shall be conducted on the flight deck of a CVN-class ship in a non-landing area.

c. The composition D service test of types I, II, V, and VI shall be conducted on the flight deck of an LHA/LHD-class ship or in a non-landing area of a CVN-class ship.

d. The service test for types I and II, compositions G and D, classes 4 and 6 nonskid systems shall be tested on a ship as designated by NAVSEA.

e. The service test for types III and IV, compositions G and D, class 5 nonskid systems shall be tested on a submarine as designated by NAVSEA.

NAVSEA may authorize alternative ship class and shipboard location for the in-service test. The service test nonskid system installation will be coordinated by NAVSEA. The coating system shall be mixed, applied, and cured according to the NAVSEA-reviewed ASTM F718 data sheet (see 6.2). The coating system shall be cleaned in accordance with shipboard requirements and shall be verified for conformance to 3.27 after the 18-month test interval for compositions G and D or after 3,000 landings for composition L.

4.11 Label. When specified (see 6.2), provide an example of the can label or a photograph of the label on a can. The label will be visually examined to determine conformance with the requirements specified in 3.28.

4.12 Prohibited materials. Prohibited materials shall be verified for conformance to 3.2.5 as required by the qualifying activity.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The nonskid systems covered by this specification are military unique nonskid systems manufactured to effectively support operation of fixed-wing aircraft on the nonskid systems and durability of nonskid system on exterior surfaces of submarines. They are intended for use on general (walking) deck areas (types I through VI and composition G) on all ships and submarines; the flight and hangar decks of aircraft carriers (types I and V and compositions G and L), the flight and hangar decks of air-capable surface combatants (types I, II, V, and VI and composition G); and the flight and hangar decks of air-capable amphibious, auxiliary, and sealift ships (types I and V and composition D). Types V and VI nonskid systems exhibit greater wear resistance than other nonskid systems and may provide an extended service life. Composition D nonskid systems are lighter weight per unit area than other nonskid systems. Other specific performance parameters that affect specific nonskid system selection criteria are defined by class, grade, and application and any questions regarding the intended use of a specific nonskid system should be directed to the Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard, DC 20376-5160 or CommandStandards@navy.mil. Current stock of nonskid systems manufactured in accordance with MIL-PRF-24667C, dated 22 May 2008, may be used until depleted; future requisitions for nonskid systems should refer to the current version of this specification.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Type, composition, class, grade, and application required (see 1.2).

c. Color and gloss required (see 3.13.1).

d. Requirement for a letter signed by the manufacturer's responsible party certifying formulation data (see 4.9.2).

e. Container size required for long-term storage stability (see 4.5.20.1).

f. Container size required for accelerated storage stability (see 4.5.20.2).

g. HAP content (see 4.8).

h. Metals content (see 4.9.1).

i. When a copy of the can label or photograph of the can label is required (see 4.11).

j. Packaging requirements and recommended packaging and labeling methods (see 5.1 and 6.7). Attention is directed to regulatory and safety requirements for labels.

k. When a Safety Data Sheet (SDS) is required (see 6.5).

l. Requirement for the manufacturer's NAVSEA-reviewed ASTM F718 data sheet (see 6.6).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 24667 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard, DC 20376-5160 or CommandStandards@navy.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.dla.mil.

6.4 Shelf-life. This specification covers items where the assignment of a Federal shelf-life code is a consideration. Specific shelf-life requirements should be specified in the contract or purchase order, and should include, as a minimum, shelf-life code, shelf-life package markings in accordance with MIL-STD-129 or FED-STD-123, preparation of a materiel quality storage standard for type II (extendible) shelf-life items, and a minimum of 85 percent shelf-life remaining at time of receipt by the Government. These and other requirements, if necessary, are in DoDM 4140.27, DoD Shelf-Life Management Program. The shelf-life codes are in the Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from DoDM 4140.27, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points that manage the item and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD Shelf-Life Management website: https://www.shelflife.dla.mil.

6.5 SDS. When specified (see 6.2), contracting officers should identify those activities requiring copies of completed SDSs, prepared in accordance with FED-STD-313. Additional required Government information is also contained in FED-STD-313. In order to obtain the SDSs, federal acquisition regulation (FAR) clause 52.2223-3 will be in the contract. The contracting activity should be provided an SDS at the time of contract award. The SDS should be provided in accordance with FED-STD-313 and ANSI Z400.1/Z129.1.

6.6 Manufacturer's NAVSEA-reviewed ASTM F718 data sheet. When specified (see 6.2), contracting officers should identify those activities requiring copies of the NAVSEA-reviewed ASTM F718 data sheet that include the coating manufacturer's generic description of the nonskid material, manufacturing data, material properties, surface preparation requirements, mixing procedures that include mixing ratios by mass and by volume, application procedures including induction time, working life, coverage rates per unit volume, the upper and lower temperature and humidity limits for application of each layer in the nonskid system, and any required safety precautions.

6.7 Packaging and marking recommendations. Recommended packaging and marking requirements are provided in table X and table XI (see 6.2).

TABLE X. Packaging.

Packaging	Recommended requirements for direct Government acquisitions
Containers	Cans should be in accordance with type V, class 2, of PPP-C-96. An interior coating should be required for cans containing water-based coatings. Plan B coating and side seam stripping should be required. Wire handles treated to resist corrosion should be required for 1-gallon (4-liter) cans. Can closure should be in accordance with PPP-C-96.
	1- and 5- gallon (4- and 19- liter) pails should be in accordance with type II, class 3 of PPP-P-704. An interior coating should be required for cans containing water-based coatings. All containers should have an exterior coating. Wire handles treated to resist corrosion should be required.
	The 6- or 6½- gallon (23- or 24.5- liter) double-compartmented pail should be in accordance with type II, class 5 or 11 of PPP-P-704. An interior coating should be required for pails containing water-based coatings. All pails should have an exterior coating. Wire handles or bails treated to resist corrosion should be required. The second compartment may be formed using a metal or plastic insert having a tray or saddle shape that is designed to rest over the edge of the pail. The insert should fit tightly, and should be of sufficient size to accommodate the unit pack curing agent, component B. The pail, lid, and insert should fit tightly without leaking. Gaskets may be used, if necessary, to ensure a leakproof fit.
	Coating components may be furnished in cartridges, burst pouches, and aerosol cans as defined in the acquisition document. As defined in the acquisition documents, static mixers should be included in cartridge kits.
	All containers should comply with the requirements of the Uniform Freight Classifications (UFC), the National Motor Freight Classification (NMFC), and the applicable requirements of the Code of Federal Regulations 49 CFR, Department of Transportation (DOT).
	Unit of procurement: The coatings covered by this specification should be purchased by volume. The unit of procurement should be in multiples of 1 liter or 1 U.S. liquid gallon at 60 °F (15.5 °C). In addition, the unit of procurement from 750 milliliters (25 fluid ounces) to 1,125 milliliters (38 fluid ounces) for coating components furnished in cartridges, burst pouches, and aerosol cans should be as defined in the acquisition document.
Commercial packaging	Commercial packaging should be in accordance with ASTM D3951.
	All containers should comply with the requirements of the UFC, the NMFC, and the applicable requirements of the Code of Federal Regulations 49 CFR, DOT.

TABLE X. Packaging – Continued.

Packaging	Recommended requirements for direct Government acquisitions
Packing	Packing should be specified as follows:
	Overseas delivery (level A) packing: Intermediate containers of like size kits of paint should be packed in close-fitting wood boxes conforming to ASTM D6251/D6251M overseas type or ASTM D6880/D6880M. Box closure and strapping should be as specified in the applicable box specification or appendix thereto, except that strapping should be flat and the finish B.
	Domestic delivery (level B) packing: Level B packing should be as for level A, except that boxes should be domestic type or class and the strapping should be finish A or B.
	Commercial packing: The paint in the unit kit and intermediate containers should, as applicable, be packed in multiples of like sizes in accordance with UFC, NMFC, and 49 CFR requirements.
Palletization	Guidance concerning Government rules for the palletization of intermediate containers is contained in MIL-STD-147. Only one size unit or intermediate container should be placed on a pallet.
Intermediate containers	Coatings should be packaged in intermediate containers as kits. Intermediate containers should be close-fitting corrugated fiberboard boxes in accordance with UFC, NMFC, and 49 CFR requirements. Fiberboard used in the construction of interior (unit and intermediate) and exterior containers, including interior packaging forms, should conform to ASTM D4727/D4727M. ASTM D4727/D4727M classes should be domestic fire-retardant or weather resistant fire-retardant (see 6.2).
Packing for acquisitions involving direct delivery to Navy ships or installations	Treated lumber and plywood. All lumber and plywood, including laminated veneer materials, used in shipping container and pallet construction, member, blocking, bracing, and reinforcing must be fire-retardant treated material in accordance with MIL-L-19140 as follows:
	General use, weather resistant: MIL-L-19140, type II, category I.
	General use, non-weather resistant: MIL-L-19140, type I, category I.
Unit kits	The coatings covered by this specification should be packed and packaged as kits. SDS, product/procedure data sheets, and a copy of the SDS and company product data/procedure sheets should be attached to the shipping document for each destination (see 6.2).
VOC certification sheets	VOC certification sheets should be provided by the manufacturer for each batch of combined parts A and B for each coat of the coating system when requested by the procuring activity.

TABLE XI. Marking.

Marking type	Recommended marking
Interior packs, containers, and palletized loads	Interior packs, containers, and palletized loads should be in accordance with MIL-STD-2073-1.
Bar codes	Marking should include bar codes.
Hazardous warnings	Labels should be in accordance with 29 CFR 1910, 1915, 1917, 1918, 1926, and 1928.
	All individual containers should have the following marking: "**CAUTION**: This paint contains volatile solvents, with probable hazardous vapors. Use with adequate ventilation. Avoid prolonged breathing of vapors or spray mists. The solvents are highly flammable; avoid open flame and smoking."
	Each component container, shipping container, and palletized load should be marked with the appropriate hazardous symbol.
	Unit containers should be marked: "This product is asbestos, lead, chromium, cadmium and silica free, except for possible trace levels."
Volatile organic content (VOC)	VOC should be stated on the label using the following statement: "Contains (insert VOC) grams per liter (insert VOC in pounds per gallon) of volatile organic content per 40 CFR 60, Appendix A-7, Method 24."
HAP content	HAP content should be stated on the label using the following statement: "Contains (insert HAP content here in g/L and lb/gal) solids (nonvolatiles) per 40 CFR 63."
Shelf-life	Each unit container, intermediate container where applicable, and shipping container should be marked as follows: "This coating has a 1-year nonextendable shelf-life and shall not be used after (insert the month and year which are one year later than the date of manufacture)."

6.8 Additional contact information. Information pertaining to the various tests/equipment in this document may be obtained by contacting Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard, DC 20376-5160 or CommandStandards@navy.mil. The appropriate subject lines to use when requesting information are as follows:

a. For the pressure cycling test, use the subject line "Nonskid pressure cycling testing".

b. For the strippability cycling test, use the subject line "Nonskid strippability cycling testing".

c. For the low profile (class 6) test, use the subject line "Nonskid low profile (class 6) testing".

d. For the force gage apparatus, use the subject line "Force gage".

e. For the temperature and corrosion cycling test, use the subject line "Nonskid temperature and corrosion cycling testing".

f. For the four-point bend fixture, use the subject line "Nonskid four-point bend fixture testing".

6.9 Linear scribe. While imparting a linear scribe to coated test panels via a cutting tool is allowed in accordance with the current specification, the implementation of masking tape prior to coating application to impart a linear scribe has been found to be an effective and efficient method. Masking tape removal as soon as possible after coating application has also been found to be a useful part of this procedure. In general, the tape and the coating will be more difficult to remove from the test substrate the closer the coating approaches full operational cure characteristics.

6.10 Toxicity evaluation. The NMCPHC requires sufficient information to permit an HHA of the product. Upon completion of the HHA, a copy will be provided by the NMCPHC to the Government for evaluation. The HHA process is described on the NMCPHC's website, http://www.med.navy.mil/sites/nmcphc/industrial-hygiene/Pages/health-hazard-assessment.aspx.

6.11 Alternate test panels for coating application, coverage, and drying. To facilitate the coating application process onto relatively small (i.e., 12- by 12- by 0.032-inch [300- by 300- by 1-millimeter] [nominal]) steel test panels, particularly with respect to the roll applied coatings, it has been found to be effective and efficient to temporarily affix or attach these small test panels to the relatively large (e.g., 8- by 4-feet by 0.032-inch [2,400- by 1,200- by 1-millimeter]) test sheets.

6.12 Supersession data. This specification supersedes MIL-PRF-24667C dated 22 May 2008, in its entirety. A cross reference of current and superseded classification designations is listed in table XII.

TABLE XII. Supersession data.

MIL-PRF-24667C classification designations	MIL-PRF-24667D classification designations 1/
Type I – High durability, rollable deck coating; composition D/G/L	Type I – standard durability, rollable; composition D/G/L; class 1 – standard; grade B – two component coating; application 1 – standard cure
Type II – Standard durability, rollable deck coating	N/A
Type III – Standard durability, rollable resilient deck coating (for use where flexibility is required and where increased weight is not a factor); composition G	Type I; composition G – general use abrasive deck system; class 4 – resilient (for use where flexibility is required); grade B; application 1
Type IV – Standard durability, sprayable deck coating; composition G	Type II – Standard durability, sprayable; composition G; class 1; grade B; application 1
Type V – Extended durability, rollable deck coating; composition D/G/L	Type V – Extended durability, rollable; composition D/G/L; class 1; grade B; application 1
Type VI – High durability, fast cure, rollable deck coating; composition G	Type I; composition G/D; class 1; grade B; application 2
Type VII – Fast cure, temporary repair, rollable deck coating; composition G/D	Type I; composition G/D; class 1; grade B; application 2
Type VIII – Low temperature cure, rollable deck coating; composition G	Type I; composition G; class 1; grade B; application 3
Type IX – High temperature resistance deck coating; composition G/L	N/A
Type X – Submerged applications; composition G	Type III – Submerged applications, rollable; composition G; class 5; grade B; application 1
Type XI – Peel and stick, temporary repair, self-adhering deck covering	MIL-PRF-24667C

NOTE:

1/ The nonskid systems associated with the MIL-PRF-24667D designations in this table are the technical equivalent of the associated MIL-PRF-24667C designations in this table. However, for distinct nonskid systems associated with the MIL-PRF-24667D specification (e.g., color stable, LSA, low profile, one component nonskids), the functionality and performance limits of those systems exceed the characteristics associated with the superseded MIL-PRF-24667C specification.

6.13 Vendor information. Contact information for the vendors specified herein is as follows:

Vision Point Systems, Inc. (3T8W5)
www.gov.visionpointsystems.com
(703) 652-4828
3951 Pender Dr.
Ste 115
Fairfax, VA 22030

6.14 Subject term (key word) listing.

Aggregate

Coefficient of friction

Color topping

Paint

Primer

Underlayment

6.15 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

CONCLUDING MATERIAL

Custodians:
Navy – SH
Air Force – 20

Preparing activity:
Navy – SH
(Project 8010-2021-002)

Review activity:
Navy – AS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla.mil.